

## THE ORIGINAL MAGAZINE FOR TRS-80™\* OWNERS

# H & E COMPUTRONICS INC.

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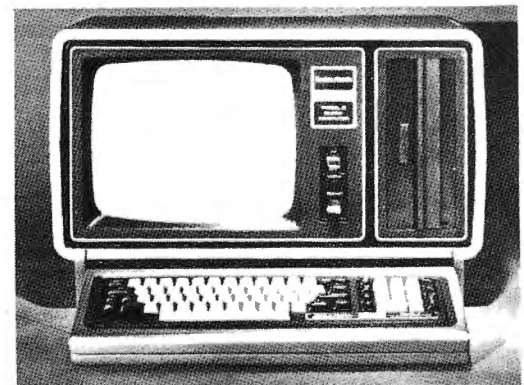
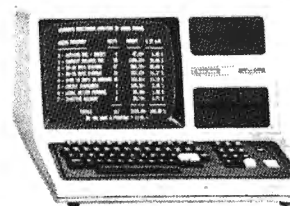
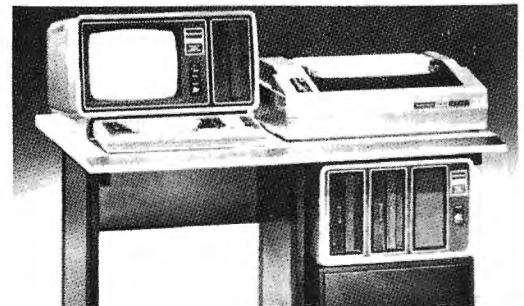
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# 8 USEFUL PRODUCTS

**NEW PRODUCT**  
Photograph not available  
at time of printing.

## 1 PRINTSWITCH

- Printer selector switch module allows two printers to be connected to a single TRS-80 system. Printer to be used is selected by switch.
- THE PROBLEM** of plugging and unplugging printer cables in order to select one printer or the other is eliminated by PRINTSWITCH.
- Small, unobtrusive design keeps your system *uncluttered*. Conveniently located switch allows instant access to either of your printers.
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- BUSINESS SYSTEMS** benefit from the ability to readily select one of two printers. For example a high speed dot matrix printer can be used for data, program listings and first drafts and a slower correspondence quality

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**BITS AND PIECES****Howard Y. Gosman****Color**

We are now accepting color advertisements in our magazine. Also, as you have no doubt noticed, we have expanded our advertising considerably, and we intend to continue expanding in the future. We would like our readers to receive the very latest information about all products available for the TRS-80 computers (all models), and often the latest information is contained in advertisements. As we expand the advertising, we can also expand the editorial content of the magazine to bring you more valuable programs and articles.

Just as we are now supporting the Color Computer in addition to the Models I, II, and III, we would also like to support the TRS-80 **Pocket Computer**. Program authors are encouraged to submit programs for the pocket computer for publication.

**Color Computer Products**

We are currently reviewing a new line of products for the TRS-80 Color Computer made by Spectral

Associates of Tacoma, Washington. They offer an impressive array of products: action game programs, utilities, books, and hardware. By the time you receive this magazine, we will have information on prices and availability. Owners of the Color Computer can call our order line to receive details.

**Mod-II**

Owners of the TRS-80 Model II are reminded that H & E Computronics also publishes a newsletter specifically for Model II users, called **Mod-II**. While we will publish articles and information about the Model II in this magazine, the newsletter is specifically for the Model II.

**Reader Survey**

All subscribers will shortly receive a postcard asking what model computer they have — a TRS-80 Model 1, 2, or 3, Color Computer, Pocket Computer or other. This will enable us to obtain more timely information for all readers. ■

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The purpose of the *H & E COMPUTRONICS MONTHLY NEWS MAGAZINE* is to provide and exchange information related to the care, use, and application of the TRS-80™ computer systems. H & E COMPUTRONICS, Inc. does not take any financial responsibility for errors in published materials. Users are advised to check and edit vital programs carefully.

The *H & E COMPUTRONICS MONTHLY NEWS MAGAZINE* encourages comments, questions, and suggestions. H & E COMPUTRONICS will pay contributors for articles and programs published in the magazine.

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## CRYSTAL BALL DEPARTMENT

### (NEW PRODUCTS OF INTEREST TO TRS-80™ OWNERS)

**WARNING:** The information found in our Crystal Ball Department does not represent verifiable fact. What follows are rumors from what we consider to be reliable sources (unless otherwise stated), or recent news of interest to TRS-80 owners.

1. Radio Shack and two other companies will shortly release "boxes" that will enable owners of the **TRS-80 Color Computer** to use up to four standard TRS-80 disk drives. The projected price for these items will be \$199. People who also own a TRS-80 Model I will be able to unplug their drives from the Model I and use them on the Color Computer. In addition, Radio Shack will support an upgrade to a 32K version of the Color Computer.

A rumor is currently circulating that Radio Shack has now sold 100,000 Color Computers. While it is impossible to verify that number, it must still be very large. Nevertheless, owners of the Color Computer have been frustrated because there has not been any software for the machine except for the few packages sold by Radio Shack. We think that the reason why so little Color Computer software has been developed is partly because of the lack of disk drives. The profit from small cassette programs is not sufficient to interest serious software writers. This is why the availability of these new packages is so important.

2. Radio Shack will announce the **TRS-80 Model 4** by the end of the year. It will support up to

128K RAM and have a color video display option. The best guess is that Radio Shack will employ a Z-8000 microprocessor, but we are not certain of the technical features of this machine's design.

3. By the end of the year, Radio Shack will also announce a new series of **hard disks** for the TRS-80 Model II only, employing the Shugart model 1006 hard disk drive. This model stores up to 8 megabytes per drive, and up to four drives can be added to the system. The cost of the first drive and controller will be approximately \$4,500. Each additional drive will be about \$3,900.

There is no indication that Radio Shack will support a hard disk for the Model III. Model III owners interested in pursuing the hard disk option should check into other companies, such as **Corvus**, which already has a prototype working.

4. Last month we reported the hot news item about the new Xerox 820 Z-80-based microcomputer selling for \$2,995. Now we have heard that Xerox also has an **under \$1,000 microcomputer** in the works under the code name of "Sunrise". The 16K expandable unit will feature color graphics, RS-232 interface and a built-in RF

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modulator (no CRT display).

5. Right behind Xerox, however, will be IBM with its "Chess" (8-color) personal computer that won over a similar unit developed by Matsushita Electric Company (Panasonic/Japan). It will contain an Intel 8088 CPU, double-sided double-density dual 5-1/4 inch disk drives and 64K RAM expandable to 256K. The price will be "in the \$3,000 to \$4,000 range". Marketing plans include ComputerLand, Sears Roebuck, and possibly J. C. Penney. ■

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## COLOR COMPUTER CORNER

H & E Computronics has obtained information on several new products for the TRS-80 Color Computer from Spectral Associates of Tacoma, Washington. We are currently evaluating this material to decide whether we should carry the items. Spectral has one of the most attractive presentations we have seen in a long time. They offer color games, utility software, several types of hardware, and books.

There are eight game programs available at this time: Color Space Invaders, Meteoroids, Space War, Game of Life, Graphic Animator, Artillery, Color Space Traders, and Madness & Minotaur. Color Space Invaders, Meteoroids, and Space War are all arcade-type action games, and the three can be purchased in a set called "Space Trilogy".

are for use with Spectral Associates boards are available. A serial I/O channel allows direct connection to a modem or serial printer. Two memory expansion kits are also available, one for 16K and the other for 32K.

Only two books were contained in the initial package: **6809 Assembly Language Programming** and **An Introduction to Microcomputers**.

By the time that you receive this magazine, we will have completed our evaluations and will probably have some or all of these items in stock. If you are interested in any of these items, please call the order line to ask whether we have them and the prices. ■

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Four programs are offered as utility software: two versions of a monitor program called "BUGOUT", one for cassette and the other requiring a PROM, an Editor/Assembler for the 6809 microprocessor, and "MAGIC BOX", a program designed to load TRS-80 Model I and III programs into the Color Computer. While there are certain inherent differences between the Models I and III and the Color Computer that will make it impractical to run many Model I and III programs on the Color Computer, there is such a large software library for the Models I and III that there will be many useful programs left. We plan to test programs published in our magazine to see whether they will run on the Color Computer, possibly with minor revisions.

Several types of hardware are offered. Five PROMs that

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**Disk catalog.** Now you can load your disk directory into memory and create a file of this information.

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## LETTERS TO THE EDITOR

### The Low Down on Radio Shack Computers

I would like to comment on a paragraph appearing in the June, 1981 issue of **H & E Computronics** by Howard Y. Gosman, publisher. The article was titled "The Low Down on Radio Shack Computers". This article was interesting; however, it was very biased. I understand that this was a quotation taken from the W5YI Report (whatever that is), but it should have, without question, been clarified.

Many "Radio Shack Authorized Dealers" do offer Radio Shack's computers and software at prices as much as 25% below the store prices. There are several things you failed to comment on:

(1) Radio Shack Authorized Dealers are usually not local and constitute a mail-order type purchase.

(2) The biggest problem is that when you buy from an authorized dealer instead of through a Radio Shack store or computer center **there is no warranty**. When you purchase from a Radio Shack store, you receive a one year warranty. If you have problems with your Model III (for example), you return it to your local Radio Shack store or Computer Center. It is then shipped to a regional repair center, and if they cannot help, to Fort Worth. When you purchase your Model III from an authorized dealer, the only warranty you get is that if you have a problem, pack it up, insure it, and ship it back to them. Then your problems just begin. Contact is a problem because of the distance. You will not get personalized service, and you don't know exactly where your \$1,000 or more investment is.

The added cost of purchasing at Radio Shack stores and Computer Centers is basically that you are buying a guarantee or warranty. In no way would I advise purchasing through a dealer. Buy local. After the warranty of one year expires, then I might possibly consider purchasing modems, disk drives or other items of other brands than Radio Shack. During your warranty period with Radio Shack (read your warranty), if you add other brands such as Percom disk drives or RS232 imitations, your warranty is **completely void**. This is because the installation of these items requires breaking of the seal of the computer to get inside. After your year warranty, then do what you want. You won't be losing anything that way, hopefully.

Michael J. Sutton  
P.O. Box 446  
Tarpon Springs, FL 33589

### Error in "Biorhythms"

What a great group of people the readers of **Computronics** are. I have been getting calls and letters with suggestions, questions, and just plain nice comments from all over the country about my Biorhythms program that was

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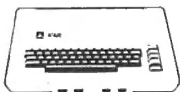
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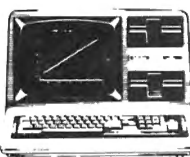
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published in the May issue.

A few of them have pointed out to me that I made one major goof in how the sine curve prints out. That is, the curves should start printing on the plus (up) side from the day of birth, and not on the minus (down) side. The easiest way to correct this error is to change line 1020:

from: FOR X=1 TO 21

to: FOR X=21 TO 1 STEP -1

Frank Growney  
89 Grove Street  
Waldwick, NJ 07463

## Copying VISICALC and Printing Directories

I got my June issue of **Computronics** yesterday. I have enjoyed the magazine and I'm glad I subscribed. Only wish I had done so earlier.

I am a semi-retired litho prep specialist and my TRS-80 Model I has Level II, 48K and two disk drives. My printer is a Model 33 teletype running under TRS232. I use it for all my business applications including bank account management, invoicing and record maintenance. I haven't troubled to write a general ledger program, and I don't need a payroll program since I work alone here at home. I'm proud of my programs — I wrote them all myself and they work fine for me.

In your Crystal Ball department, item 4, you state that Visicalc cannot be copied. I bought mine from Radio Shack, paid \$99.00 for it and I can indeed make backup copies. It is the same as making a copy of any TRSDOS disk. Perhaps the Personal Software people produce a different version under their own name.

Mr. Gary R. Johnson's question about printing out the directory of a disk is more easily answered. If he has any version of NEWDOS he can go to BASIC, enter CMD"DIR" and then use the JKL screen print utility. I do this from time to time and paste the print-out on my disk jacket. Then I number the jacket and the disk. It saves a lot of confusion when one is operating with a number of disks.

Jay Cox  
15 Lake Drive East  
Wayne, NJ 07470

## Users' Group of West Los Angeles

The TRS-80 Users' Group of West Los Angeles is now forming. Exchange of public domain software and discussions of hardware and software topics are planned. Interested parties should call (213) 836-4103 or write P. O. Box 85, Culver City, CA 90230.

Mike Miller  
10210 Woodbine St., #1  
Los Angeles, CA 90034

### Error in Keyboard Input Buffering Program

Unfortunately, an error has crept into the Keyboard Input Buffering program that was published in the February 1981 issue of **Computronics**. Line 250 should read JR Z,NOINIT and not JR NZ,NOINIT. What was intended as a security measure if the routine was initialized more than once has turned into code which insures that it will never be initialized. Hopefully your future typing will be correctly buffered!

Arne Rohde  
Pilevej 31  
7600 Struer, Denmark

### EPSON MX-80 program on Model II

Joseph Rosenman's Epson MX-80 initialization program is appreciated. However, he forgot us poor Model II users. I've tried to make it work, but I do not know BASIC well enough to convert it to MOD II. I've got a MOD II and MX-80. What a shame I can't use them to the full advantage!

Bill Apresti  
N. S. I. Systems Incorporated  
1235 Lowery Court  
Norfolk, VA 23502

Mr. Rosenman replies:

Sorry that you've had trouble adapting the program to your Model II. Although I don't own a Model II, I am told that there are very few differences between the two BASICs (they were both written by Microsoft). The two most important differences are that Model II BASIC does not support the PEEK and POKE functions, and the syntax of the IF statement is slightly different. There are no PEEKs or POKEs in the program, so the problem must be with the IF statements. The major difference is that, in Model II BASIC, you must use the "IF <question> THEN <action>" syntax (in Model I you can leave out the THEN). There are IF statements in line numbers: 100, 270, 280, 290, 490, and 500. I will reproduce line 100 "before" and "after" to show how they must be modified.

```
IF D$='T' GOTO 370 ELSE IF D$<>'S' GOTO 90 ELSE CLS
```

becomes

```
IF D$='T' THEN 370 ELSE IF D$<>'S' THEN 90 ELSE CLS
```

Note that the 40 character-per-line mode cannot be permanently set (as mentioned in the June issue of **Computronics**).

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  - b) Turn off RTS,
  - c) Receive data only from terminal,
  - d) Receive data only from host,
  - e) Send data only to host,
  - f) Send data only to terminal,
  - g) Operate in dumb terminal mode,
  - h) Operate in ST80™ mode,
  - i) Check CTS status. (clear to send)

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As a new subscriber to your publication, I would like to compliment you on the content of your magazine. I requested that my subscription begin with the first issue and so have been able to see the growth of H & E over a two year period in just a few days. An interesting experience.

I would like to bring to your attention an often neglected section of the TRS-80 readership, the agricultural users. We have formed a users' group, which operates through the mail, for all agricultural microcomputer owners. We have a newsletter in which practical agricultural uses for microcomputers are presented along with program reviews and member comments. As a service to your many readers in the agricultural field, would you publish the above information in your magazine?

Ken Harris  
Agricultural Users Group  
RT 2 Box 138  
Golden City, MO 64748

**Problems with "Checkers 80"**

I am enclosing a copy of a letter mailed today to Ed Juge at the Tandy-Radio Shack headquarters. Needless to say, I reached the end of my rope with the "Checkers 80" program.

Keep up the excellent work on **Computronics** magazine. I am completely satisfied with your publication.

The letter follows:

Dear Mr. Juge:

Enclosed is a copy of "Checkers 80", which I am returning to Radio Shack for the fourth time. I purchased this original tape in December, 1980 from a Radio Shack in Buffalo, New York. When I returned to Saudi Arabia, I tried to load the program, with no success. I returned the tape to store #8344 and explained the problem.

Approximately six weeks later, I received a second tape. It had the same problem with loading. I again returned the tape — this time with a letter explaining that I was working in Saudi Arabia and just couldn't take the tape to a store around the corner. I further asked if the tape could be checked before sending it to me.

Yesterday, I finally received copy #3 of this program. When I tried to load the program, I got nothing — no blinking asterisks. I "listened" to the tape with a radio near the computer, and heard a program loading, or at least running. I took the cassette out of my recorder, and when I saw that the tape was loaded upside down in the cassette, I gave up.

I have received bad cassettes from various companies, and when the bad cassette is returned, I often receive a

new tape which is clearly marked with some sort of quality assurance check or verification. My opinion is that Radio Shack does not have a quality assurance program in effect.

I am disgusted with the performance of Radio Shack dealers. There is no doubt in my mind that I will no longer order programs from Radio Shack.

I am returning this tape to you, Mr. Juge. I really don't care if I ever see this program again. My single consolation with this shabby performance is that I almost purchased the Casino Pack. I am certain that there are other companies which manufacture a comparable pack, with quality in mind.

Richard P. Thrun  
Northrop Box 862  
APO New York, NY 09616

\*\*\*\*\*

H & E Computronics welcomes letters on any subject. If you wish a personal reply, please enclose a self-addressed, stamped envelope.

\*\*\*\*\*

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# PROGRAM PREVIEWS

A. A. Wicks

## This Month: NEWBASIC

The TRS-80 Model III promises to be an extremely versatile computer, and no doubt the sales volume will be high — although not on such a steep curve as was the Model I. This will be partly due to the fact that a large part of the market base has already been acquired by some 200,000 Model I sales, and a great many of these owners will not be “upgrading” to the Model III. This lack of desire (money, interest), will be deepened further by the software merchants out there providing substitutes for many of the incentive features of the Model III. This trend is evident already, and one of the earliest arrivals is Modular Software Associates’ NEWBASIC. Not that NEWBASIC replaces all of the Model III’s enhancements, by any means, but many of the more desirable niceties show up in NEWBASIC. NEWBASIC is not to be confused as being another Disk Operating System, although a few of the features of NEWDOS (R) are within its capabilities. No, NEWBASIC is pretty well just exactly what its name implies — a “new” BASIC. Nevertheless, it does not stand alone, but rides along with TRSDOS (R) 2.3, NEWDOS 2.1 (R), or NEWDOS/80 (R).

NEWBASIC is a disk-based system in the version purchased for use and review. It is also available for Level II cassette operation, except that purely disk-oriented commands will obviously not respond. In any event, with disk operation, one drive is sufficient, but because the program is appended to a DOS, the more RAM memory available the better (32K minimum), as it will require nearly 7K bytes of memory, in itself.

In order to create a NEWBASIC disk, a utility called “CREATOR” (no divine intervention, however), is called from the supplied NEWBASIC disk. At that point, a screen display will step you through a query list of all of the features of NEWBASIC, and you have the option of including or rejecting any command you may choose. Upon completion of the list, the screen will state the total size of the commands that have been selected for inclusion. You then choose a file specification name (NEWBASIC/CMD is the default), and press ENTER, at which time the NEWBASIC file you have created will be saved to diskette. The diskette you save it to must already have an operating system. This is not made clear in the manual, and may puzzle some users. Once this action is completed you now have a DOS diskette with NEWBASIC on it, and it is only necessary to call it from DOS by typing “NEWBASIC” (if that was the name selected), as you would call BASIC. Incidentally, the normal BASIC/CMD must exist for NEWBASIC to operate. When you have

made a NEWBASIC diskette, you no longer need to use CREATOR, unless in the future you wish to change the command choices you have made.

After a brief display of both RS and Modular Software Associates’ copyright notices, the screen clears, and the cursor awaits your command. You may now operate the many commands of NEWBASIC, directly or within programs you are entering from the keyboard, or have loaded and are modifying. As an example, BLINK turns on a flashing cursor in place of the usual. This will remain on and flashing at a little faster rate than once per second, until the command is typed again. Because I use SCRIPSIT® a great deal, which has a blinking cursor, I now turn on BLINK at all times when using NEWBASIC, in order to “feel comfortable,” so to speak. For the same reason, I turn on repeating keys with NEWBASIC’s REPEAT command. Any key and space then will repeat, after being held down briefly. (Both of these functions are in the Model III.) Additionally, although I do not make use of it, REPEAT will cause a “beep” to be heard when a key is depressed, if a small amplifier/speaker is attached to the cassette-out line of the TRS-80. The REPEAT function is especially useful when in EDIT mode, it is far more convenient to zip along to a correction point than by using “2S:” for example.

There are 28 additional commands available in NEWBASIC. (Keep it in mind too, that all of the normal BASIC commands are in there, too!) A few of the more interesting or more useful commands will be described. The first few to be mentioned are only applicable to operators who have disk systems, as these commands are Disk NEWBASIC oriented.

One of the most convenient is DIR. Almost like the DOS DIR, but the resultant display is far more informative, and this command, as are all the others, is called right from NEWBASIC. The top line essentially produces what you normally get with FREE in DOS — the drive number being read, date of formatting, and the number of free sectors remaining on the diskette. Below this is presented the file name, including extension, if any, followed by the size of each file in sectors. Displays for other drives are acquired in the usual manner, but still from BASIC, e.g., DIR :1. The major benefit from this and the other commands is that you remain in NEWBASIC, and once the Directory has been displayed, you may continue with what you were doing in NEWBASIC.

SPOOLON command sends printer output to a specified disk file. The convenience of this becomes

obvious when you consider that this function may be performed in seconds. Later, while other computer operations are being performed, this file may be sent to the printer using DESPOOL, as despooling may be performed concurrently. Either parallel or serial printer operation may be used, the latter using an RS-232-C port.

The DLOAD command will load object files into RAM, with control returning to BASIC. And DRUN exits NEWBASIC to execute the requested object file; however, a return to NEWBASIC is not possible following this command.

The commands just mentioned and a few others are the only ones not available to non-disk users. The commands commented upon below are available to all users of NEWBASIC.

For instance, there is a subset of QUICKKEY commands that permit shorthand notation for certain BASIC keywords. The command toggles this feature on and off, with 38 words being made available in this notation. An example of such a keyword is DATA = D, a very nice help when you may be entering many, many Data lines. Another is GOSUB = G, and so on. Most of the words are mnemonically associated with the letter selected as the short form, as noted in the above examples. A condensed-print Table of these keywords is printed in the manual, so that it may be photocopied for reference and kept nearby.

There are several graphics commands that are quite useful, especially if you are preparing programs that would benefit in having borders around the display. This technique is used to advantage in the RS Disk BASIC training course, and it is quite attractive when used this way. One of the commands is RECT, followed by screen location points just as in SET; but parentheses are not required around the argument. Typically, RECT 0,0,127,47 will draw a perimeter one graphic block wide around the outside of the video display, very rapidly (less than a second). WTS will "white-out" the video in a little over a second, by turning on all of the graphics blocks. This function must have some useful purpose, probably a game program could utilize it by "flashing" the screen from white to black. One more graphics example from NEWBASIC is LINE (with an argument the same as RECT), which turns on the graphics blocks in a straight line. The argument given for RECT above would, in this case, draw a line from the top left of the display to the lower right, again — "instantly."

A number of commands are of use in program debugging. NTRON allows you to specify exactly what lines are to be traced, rather than the normal trace of all program lines. There are a number of qualifiers to this command, and I have found it limiting to a degree for this reason. But within its parameters it is very useful, and a rather nice bonus is that the current value of variables or expressions appear on the screen before

each line is traced. There are a number of other commands in the programming category that permit some interesting short-cut approaches, but space does not permit including them all here.

Video output may be echoed to a printer by using the PON command. This command also works with printer driver routines such as the TRS-232 system by Small Systems Software. I have been using this command very effectively in a program that requires an output to the printer line-by-line as entered from the keyboard.

A rather interesting command, once again possibly useful for game programs or any alerting situation, is SOUND, whereby a choice of a wide range of tones and tone durations can be directed to the cassette output port. The arguments for the command may be constants, variables, or expressions, SOUND using the integer portion. Two Tables are provided in the manual, one showing the arguments to produce any one of 33 frequencies from 65 to 14250 Hz, and one for 10 different durations from .01 to 1.84 seconds.

RS-232-C interface owners will be pleased to know that they can initialize this function from NEWBASIC. A screen display shows current status of the UART sense switches. If the baud rate is not within the range possible the word "other" will appear. A dialog then ensues, permitting the setting of Baud Rate, Parity Enable-Disable, Stop Bits, Word Length, and Parity Odd-Even. This was the only function I was not able to try, not having a RS-232-C board. Two more commands are associated with the RS232 command, RSIN — enabling the input of characters either from the keyboard or the RS-232-C interface, while RSOUT will route printer output to the RS-232-C interface. The RSIN command, mentioned above, used in conjunction with the RSOUT command, will, according to the program authors, make possible the implementation of terminal programs, automatic log-on to time-sharing networks, and remote terminal input and output, all in NEWBASIC. A short program is provided in the manual, which would automatically initiate log-on to a remote terminal. Once again, it was not possible to utilize this function, but there is no reason to believe that this should not operate satisfactorily.

The manual accompanying the program comprises 42 pages is clearly understandable, and there are very satisfactory and ample examples shown for every command. A thirteen-item "Glossary for NEWBASIC" is provided. This is helpful, although about half of the entries are for common computer-oriented expressions. This Glossary could be usefully expanded with even more NEWBASIC-associated terminology. The manual has been printed from typewriter font copy, with some minor fadeouts (of the original, no doubt), but it has not been photographically reduced — a welcome relief from much of the documentation now being

*continued on page 16*

## MODEL III CORNER

### Model III Won't Generate Control Characters

I have a very early TRS-80 Model III which will not generate control keys. The manual comments on a little blue slip that came with it say "the key combination shift up arrow does not generate a control key. The only control keys available are those specially named keys such as BREAK and ENTER."

Can I do the hardware fix that Radio Shack offers for \$20 myself? What is it? Is there a software fix that will enable me to generate control-S, -I, -O, etc. to control my Epson MX-80 printer?

The dealer says this is only the case on the first 600 or so machines made and later models work in spite of the manual. Also note: the only problem so far with my 32K cassette machine is an intermittent ability to turn off the cassette player. Otherwise it is performing very well and fun.

(Bill Berson, 18 Fairport Road, Westport, CT 06880)

### ANSWER

It is unfortunate that Radio Shack has created this problem for you and now wants you to pay to have it fixed, but we can't think of any practical alternative to the \$20 modification. Besides the fact that we don't recommend that you void your warranty and open the computer, it would probably be impossible for you to get the ROM chip that you need from any place other than Radio Shack. It would cost at least as much if not more.

While Radio Shack fixes this problem by adding a ROM chip, it is actually simply a keyboard driver program (along with other goodies) that is added, and this could be done entirely through software if you could get the program. We have looked into this program, and it is extremely complicated. Maybe it could be shortened, but there are many fancy things going on in it. We still recommend the hardware fix. Once you get it fixed, you can generate all control keys by using shift-down arrow and then a letter (including "a").

### Editor/Assembler for the Model III

Page 50 of issue 33 says that the Editor/Assembler program "works" on the Model III. Does this refer to the tape Editor/Assembler listed for \$29.95 on page 8 of the current Radio Shack Computer Catalogue? If so, I'm confused, because the Radio Shack catalogue says "Model I only" for this program.

Also, issue 33 advertises two Basic Compilers which seem to offer roughly the same capabilities. Can you explain the relative merits of buying one (i.e. Basic) vs. the other (i.e., Assembly Language).

Finally, please tell me what additional options I may have for getting machine language programs into my Model III computer. I desperately need more speed than I can get from the Basic programs I am now tied to.

(L. C. Baird, 320 East North Avenue, Pittsburgh, PA 15212.)

### ANSWER

The Editor/Assembler that we were referring to in issue number 33 is the Apparat **NEWDOS** or **NEWDOS80** version. When patched as shown there, it will work, but **ONLY** when running under TRSDOS version 1.1! The \$29.95 tape Editor/Assembler **WILL NOT WORK** on the Model III.

Issue number 33 advertises only the ZBASIC compiler by Simutek. The other well-known one is by Microsoft. Basic compilers will **DEFINITELY** speed up the operation of your programs, but I would advise that you study them carefully before buying. ZBASIC, as advertised, only supports integer calculations, but there is a later version that supports all computations, as does Microsoft's compiler. Basic compilers must be distinguished from assemblers. Compilers produce machine code from source code in symbolic higher-level languages, whereas assemblers produce direct machine code.

We will continue to publish information on machine programs available for the Model III as we receive it. More and more programs are appearing now.

### Electric Pencil for the Model III

Model I users of the Electric Pencil word processing system have been disappointed if they have moved up to the Model III, because a version of this program for the Model III has yet to appear. We have heard rumors about the Electric Pencil program being purchased by Harvard Pennington, of "Disk and Other Mysteries" fame, and a new version in the works, but we have yet to see it announced or available. We can't even get more copies of the Model I version to sell now.

Now we have finally come up with a solution: Dr. Howe has written a program that patches the Model I disk version of the Electric Pencil program to make it work on the Model III exactly as it does on the Model I. To use it you must already have the Model I version of the program. Either save it on cassette tape and load it into the Model III, or use the Convert utility program to save it on a Model III disk. Then all you do is run the program and it works.

*continued on page 23*

**TRS-80 (Level II)\*\*  
NORTH STAR  
CP/M Disks/Diskettes**

**CRIBBAGE 2.0 (TRS-80 only)** Price: \$14.95 Cassette/\$18.95 Diskette  
This is simply the best cribbage game available. It is an excellent program for the cribbage player in search of a worthy opponent as well as for the novice wishing to improve his game. The graphics are superb and assembly language routines provide rapid execution. See the software review in 80 Software Critique.

**MORSE CODE TRAINER (TRS-80 only)** Price: \$13.95 Cassette/\$14.95 Diskette

MORSE CODE TRAINER is designed to develop and improve your speed and accuracy in deciphering Morse Code. As standard, MCT is an ideal software package for FCC test practice. The code sound is obtained through the earphone jack of any standard cassette recorder. You may choose the pitch of the tones as well as the word rate. Also, various modes of operation are available including number, punctuation and alphabet tests, as well as the keying of your own message. A very effective way to learn code!

Why pay \$7.95 or more per program when you can buy a DYNACOMP collection for just \$10.95?

**TIDY (TRS-80 only)** Price: \$10.95 Cassette/\$14.95 Diskette

TIDY is an assembly language program which allows you to renumber the lines in your BASIC programs. TIDY also removes unnecessary spaces and REMark statements. The result is a compacted BASIC program which uses much less memory space and executes significantly faster. Once loaded, TIDY remains in memory; you may load any number of BASIC programs without having to reload TIDY!



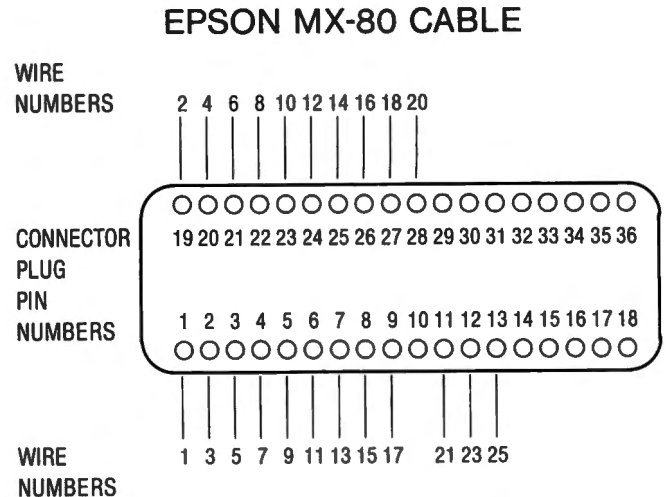
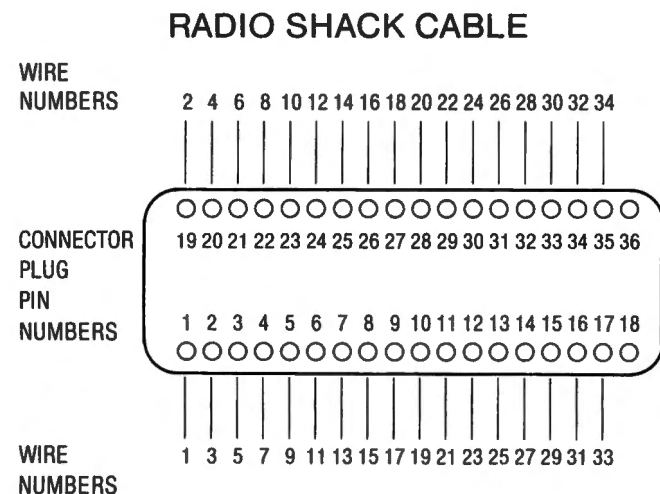
**\*\*TRS-80 diskettes are not supplied with DOS or BASIC. All DYNACOMP programs for TRS-80 will run on model III with the exception of TIDY, GRAPHICS, CRIBBAGE ? 0.**

# CONVERTING THE RADIO SHACK CABLE INTO AN EPSON CABLE

Joseph Rosenman

One day, they will invent a longer EPSON MX-80 cable. The EPSON cable is about three feet long, and if you acquire the perverse desire to locate your printer on the right of your TRS-80, you are going to be in trouble. After hearing rumors that the EPSON cable and the Radio Shack cable are the same, I ordered a five foot Radio Shack printer cable. The printer did work, but it seemed to skip an extra line all the time. Then, I discovered that I couldn't underline. The rumors were false! There are a few differences between the Radio Shack cable and the Epson cable. The most important difference is that the Radio Shack cable doesn't discriminate between line feeds and ENTERs. Much of the software expects that the printer requires both a line feed and a carriage return (ENTER), and that is why the printer skips an extra line.

The answer to my problem was to convert my Radio Shack cable into an EPSON cable. After taking apart both cables and studying their construction, I discovered that the differences between the cables were clear and easy to spot. In Figure 1, there are diagrams of both cable connectors on the printer side (called a 36 pin Amphenol connector). The EPSON cable has no connection between eleven wires and pins. After disconnecting those eleven wires, I found that my Radio Shack cable functioned exactly as the EPSON cable did. While the procedure is very simple, it should only be attempted by individuals who are familiar with such things. You wouldn't want to cut the wrong wire. The total time needed for this modification is under fifteen minutes, and it can be accomplished with a small screwdriver and needle-nosed pliers.



To convert the Radio Shack Printer cable to an Epson MX-80 cable, disconnect the wires going to pin numbers:

19 22 24 26 27 29 30 31 32 33 34

(Note: no wire is ever connected to pins 18 and 36.)

*continued from page 13*

provided. There is a minimum of misspelled words, and these are consistently misspelled throughout the manual.

This short review cannot adequately do justice to all of the features available in NEWBASIC. Overall, this program is an excellent utility, and is well worth its very modest cost. In fact, I believe the half dozen or so commands I am using consistently are alone worth the investment. The fact that this appears to be a problem-free program from initialization through to comfortable and easy full use, makes it a "happy" acquisition to anyone's library of programs. Whether you are writing programs for business or pleasure, or if you are only interested in adding some very pleasant operating features to your computer, I have no hesitation in recommending it for your use and enjoyment.

NEWBASIC - Modular Software Associates; distributed by Computer Information Exchange, Box 159, San Luis Rey, CA 92068, and other dealers. Disk version (with disk) \$35.90. Level II Cassette \$19.95. ■

# ALIEN INVASION FORCE

Andrew S. Braunstein

This game program is designed to be played on a TRS-80 with 16K of RAM.

I am sure that most of you have seen the ever-popular "SPACE INVADERS" or "GALAXIAN" or ads selling imitations of these games for popular micro-computers at \$14.95 and up. Don't despair, because here is my version called ALIEN INVASION FORCE, which will give you countless hours of delight as you try to beat your opponent's score, or if you play alone, your score.

The aliens move back and forth, shower you with lethal bullets, and they will come down and attack, so **beware!** This game doesn't just involve luck, but skill is very important. You won't always be able to fire at the aliens, but you will always be able to move right and left. So when you can't fire, you had better get out of the way — fast!

To move left, use the left arrow key. To move right, use the right arrow key. Use the space bar to fire your laser. The game will function smoother if you hold down the keys instead of hitting them rapidly (also saves wear on the keyboard). There is a built-in repeat function, so if you hold down a key, that action will continue until you let go. The arrows next to each player's score indicate how many turns they have left. Each player initially has three turns. The score displayed in the middle is the current high score.

Good luck!

```
10 ' *****
11 '          "ALIEN INVASION FORCE          **
12 '          VERSION 1.65                  **
13 '          (C)1981 BY ANDREW S. BRAUNSTEIN **
14 ' *****
20 CLEAR 800
30 S(1)=0 : S(2)=0 : CLS : RANDOM : C$(1)=STRING$(3,91) :
C$(2)=C$(1) : DEFINT A-Z : PRINT @ 0, "ALIEN INVASION FORCE"
40 G=8 : GOSUB 120 : G=0 : H=316 : PRINT @ 128, "WE ARE THE
CENTURIANS"; : PRINT @ 201, "YOUR MISSION: TO DESTROY THE
CONVOY";
50 FOR X=1 TO 5 : U=(10-X)*10 : U$=LEFT$(G$(X),8)+STRING$(20,32)
+STR$(U)+" POINTS " : FOR B=64 TO 19 STEP -1 : PRINT @ H+B,
LEFT$(U$,65-B); : FOR D=1 TO 9 : NEXT
60 NEXT : H=H+128 : NEXT
70 J$=INKEY$ : PRINT @ 960,STRING$(14," ") : FOR X=1 TO 200 :
NEXT : PRINT @ 960, "1 OR 2 PLAYERS"; : FOR X=1 TO 200 : NEXT
80 IF J$ = "" THEN 70 ELSE IF J$ = "1" THEN P=1 : GOTO 90 ELSE
IF J$ = "2" THEN P=2 : GOTO 90 ELSE GOTO 70
90 CLS : D=1 : A=2 : K=RND(20)+25 : G=9 : GOSUB 120 : G=0 :
Y=1 : U$=STRING$(20,128)
100 C=1
110 PRINT @ 956+K, S$ CHR$(30) : C$(C)=LEFT$(C$(C),3-Y) :
T0=45 : T9=1 : IF C = 1 FOR H=1 TO 6 : FOR X=1 TO 300 : NEXT :
PRINT @ 24, U$; : FOR X=1 TO 300 : NEXT
```

```
115 PRINT @ 27, "PLAYER ONE"; : NEXT ELSE FOR H=1 TO 4 :
FOR X=1 TO 300 : NEXT : PRINT @ 24, U$; : FOR X=1 TO 300 :
NEXT : PRINT @ 27, "PLAYER TWO"; : NEXT
120 TS=RND(10)+3 : PRINT @ 704, STRING$(63,128); :
G$(1)=CHR$(171)+CHR$(147)+CHR$(143)+CHR$(163)+CHR$(151)+" " :
G$(1)=G$(1)+G$(1)+G$(1) : G$(1)=STRING$(2,128)
+G$(1)+G$(1)+G$(1)+STRING$(2,128)
130 G$(2)=CHR$(139)+CHR$(183)+CHR$(131)+CHR$(187)
+CHR$(135)+" " : G$(2)=G$(2)+G$(2)+G$(2) : G$(2)=STRING$(2,128)
+G$(2)+G$(2)+G$(2)+STRING$(2,128)
140 G$(3)=CHR$(135)+CHR$(175)+CHR$(131)+CHR$(159)
+CHR$(139)+" " : G$(3)=G$(3)+G$(3)+G$(3) : G$(3)=STRING$(2,128)
+G$(3)+G$(3)+G$(3)+STRING$(2,128)
150 G$(4)=CHR$(151)+CHR$(139)+CHR$(191)+CHR$(135)+CHR$(171)
+" " : G$(4)=G$(4)+G$(4)+G$(4) : G$(4)=STRING$(2,128)+G$(4)
+G$(4)+G$(4)+STRING$(2,128)
160 G$(5)=CHR$(155)+CHR$(147)+CHR$(143)+CHR$(163)+CHR$(167)
+" " : G$(5)=G$(5)+G$(5)+G$(5) : G$(5)=STRING$(2,128)+G$(5)
+G$(5)+G$(5)+STRING$(2,128)
170 G$(10)=STRING$(64,128) : IF G = 8 THEN RETURN
180 S$=" " +CHR$(176)+CHR$(188)+CHR$(191)+CHR$(188)+CHR$(176) :
I=9 : GOSUB 290 : I=0 : IF G < 9 THEN PRINT @ 24, "--==<";
STRING$(7-LEN(STR$(HS)),48); MID$(STR$(HS),2); ">==->";
190 D=D+A : PRINT @ 64+D, G$(1); : PRINT @ 192+D, G$(2); :
PRINT @ 320+D, G$(3); : PRINT @ 448+D, G$(4); : PRINT @ 576+D,
G$(5); : PRINT @ 956+K, S$ CHR$(30); : IF G = 9 RETURN
200 IF D >= 8 THEN A=-2 ELSE IF D < 1 THEN A=2 ELSE IF
RND(6) = 1 THEN A=-A
210 IF BB = 7 THEN BB=0 : RETURN ELSE FOR T1=1 TO 6 :
IF PEEK(14400) = 128 GOSUB 290 : GOTO 250
220 IF PEEK(14400) = 32 THEN K=K-4 : IF K < 0 THEN K=0
230 IF PEEK(14400) = 64 THEN K=K+4 : IF K > 58 THEN K=58
240 PRINT @ 956+K, S$ CHR$(30); : NEXT : IF RND(3) = 2
THEN BB=7 : GOSUB 190
250 GOSUB 390 : IF L0 = 99 THEN 280 ELSE BB=7 : GOSUB 190 :
IF RND(2) = 2 THEN 250
260 GOSUB 470 : IF L0 = 99 THEN 280
270 IF RND(2) = 1 THEN AB=8 : GOSUB 470 : PK=4 : GOSUB 770 :
AB=0 ELSE IF RND(75) = 25 THEN T0=45 : GOTO 120
280 IF L0 < 99 THEN 190 ELSE L0=0 : C=C+1 : IF C <= P
THEN 110 ELSE Y=Y+1 : IF Y > 3 THEN 680 ELSE 100
290 W=4 : V=0 : IF I = 9 THEN 370
300 IF W < 4 THEN RESET((K+2)*2,50-W) : RESET((K+2)*2,51-W)
310 SET((K+2)*2,44-W) : SET((K+2)*2,45-W) :
IF POINT((K+2)*2,43-W) GOSUB 340 : V=1 : T2=7 : PL=1
320 IF PL = 1 G$(Q)= LEFT$(G$(Q),ABS(INT((K-D+6)/6)*6-4))
+ STRING$(5,128)+MID$(G$(Q),ABS(INT((K-D+6)/6)*6+2) : BB=7 :
GOSUB 190 : PL=0 : Q=0
330 W=W+6 : IF W > 40 OR V = 1 THEN RESET((K+2)*2,50-W) :
RESET((K+2)*2,51-W) : IF T2 = 7 THEN T0=T0-1 : T2=0 : IF
T0 <= TS THEN T0=45 : GOTO 120 ELSE BB=7 : GOSUB 190 :
RETURN ELSE RETURN ELSE 300
340 IF W = 16 THEN Q=5 : GOTO 360 ELSE IF W = 22 THEN Q=4 :
GOTO 360 ELSE IF W = 28 THEN Q=3 : GOTO 360 ELSE IF W = 34
THEN Q=2 : GOTO 360 ELSE IF W = 40 THEN Q=1 : GOTO 360
350 Q=10 : IF E > 704 AND W = 10 THEN F$=STRING$(9,128) :
GV=2 : PRINT @ 704, STRING$(64,128); : U=-MM : U=10+U :
```

```

U=U*10 : S(C)=S(C)+U : E=0 : GOTO 370
360 IF Q < 10 AND MID$(G$(Q),K-D+3,1) < CHR$(128) THEN
U=Q : U=10+U : U=U*10 : S(C)=S(C)+U
370 PRINT @ 3, STRING$(7-LEN(STR$(S(1))),48);
MID$(STR$(S(1)),2); : PRINT @ 10, C$(1); " " :
IF P = 2 THEN PRINT @ 54, STRING$(7-LEN(STR$(S(2))),48);
MID$(STR$(S(2)),2); : PRINT @ 50, STRING$(4,32); :
PRINT @ 53-LEN(C$(2)), C$(2);
080 RETURN
390 R=RND(50)+D+2 : W1=8
400 SET(R*2,W1) : GOSUB 450 : W1=W1+6 :
IF W1 > 46 RESET(R*2,W1-6) : RETURN
410 RESET(R*2,W1-6)
420 IF PEEK(14400)=32 THEN K=K-4 : IF K < 0 THEN K=0
430 IF PEEK(14400)=64 THEN K=K+4 : IF K > 58 THEN K=58
440 PRINT @ 956+K, S$ CHR$(30); : GOTO 400
450 IF K <= R AND R < K+5 AND W1 = 44 THEN RESET(R*2,W1) :
FOR X=1 TO 3 : PRINT @ 960, STRING$(63,128); : FOR Z=1 TO 200 :
NEXT : PRINT @ 956+K, S$; : FOR Z=1 TO 200 : NEXT Z,X : L0=99
460 RETURN
470 KL=RND(3) : PL=RND(9) : FOR MM=KL TO 5 : FOR X=PL TO 9 :
IF MID$(G$(MM),4+((X-1)*6),6) = STRING$(6,128) THEN NEXT X,MM :
RETURN ELSE 480
480 F$=" " + MID$(G$(MM),2+(X-1)*6,6) + " " : IF AB = 8
THEN RETURN
490 IF X > 5 THEN M1=-1 : RR=-3 : NH=56 : ELSE M1=1 : NH=0 : RR=3
500 HN=6 : GOSUB 540 : G$(MM)=LEFT$(G$(MM),1+(X-1)*6)
+ STRING$(6,128)+MID$(G$(MM),8+((X-1)*6)); : BB=7 : GOSUB 190
510 FOR E = MM*128+NH TO 704 STEP 128 : PRINT @ E+RR, F$; :
GOSUB 640 : PRINT @ E+RR+4, STRING$(6,128); : RR=RR+M1*RND(5) :
IF RND(2) = 2 THEN BB=7 : GOSUB 190 : IF RND(2) = 1 THEN HN=6 :
H1=1 : GOSUB 540 : H1=0
520 NEXT E : PRINT @ E+RR-64, F$; : IF X > 5 THEN BE=54+RR :
EN=-2 : ST=-8 ELSE BE=-2+RR : EN=54 : ST=8
530 GV=0 : FOR EE=BE TO EN STEP ST : IF GV = 2 THEN RETURN
ELSE PRINT @ 704, STRING$(64,128); : PRINT @ 704+EE, F$; :
IF RND(2) = 2 THEN GOSUB 600 : IF L0 = 99 THEN PRINT @ 704,
STRING$(64,128); : RETURN
540 IF RND(3) < 1 AND H1 = 1 THEN 550 ELSE IF PEEK(14400)
= 128 THEN GOSUB 290 : GOTO 570
550 IF PEEK(14400) = 32 THEN K=K-4 : IF K < 0 THEN K=0
560 IF PEEK(14400) = 64 THEN K=K+4 : IF K > 58 THEN K=58
570 PRINT @ 956+K, S$ CHR$(30); : IF HN = 6 THEN HN=0 :
RETURN ELSE IF RND(4) = 2 THEN BB=7 : GOSUB 190
580 NEXT EE : PRINT @ 704, STRING$(64,128);
590 T0=T0-1 : IF T0 <= TS THEN T0=45 : GOTO 120 ELSE PK=1 :
GOSUB 770 : RETURN
600 N=37
610 IF N < 37 THEN RESET(EE*2+12,N-3) : IFRND(4) = 2 THEN
GOSUB 640
620 SET(EE*2+12,N) : N=N+3 : IF EE >= K-6 AND EE <= K-2 AND
N = 46 THEN RESET(EE*2+12,N-3) : FOR X=1 TO 3 : PRINT @ 960,
STRING$(63,128); : FOR Z=1 TO 200 : NEXT : PRINT @ 956+K, S$; :
FOR Z=1 TO 200 : NEXT Z,X : L0=99 : RETURN
630 IF N >= 47 THEN RESET(EE*2+12,N-3) : RETURN ELSE 610
640 IF PEEK(14400) = 32 THEN K=K-4 : IF K < 0 THEN K=0
650 IF PEEK(14400) = 64 THEN K=K+4 : IF K > 58 THEN K=58
660 PRINT @ 956+K, S$ CHR$(30); : IF RND(4) = 2 THEN BB=7 :
GOSUB 190
670 RETURN
680 CLS : G=8 : GOSUB 120 : G=0 : D=0 : SS=2 :
IF S(1) > S(2) THEN HX=S(1) ELSE HX=S(2)

```

```

690 IF HX > HS THEN HS=HX
700 PRINT @ 768, "PLAYER ONE"; : PRINT @ 834,
STRING$(7-LEN(STR$(S(1))),48); MID$(STR$(S(1)),2); :
IF P = 2 THEN PRINT @ 822, "PLAYER TWO"; : PRINT @ 888,
STRING$(7-LEN(STR$(S(2))),48); MID$(STR$(S(2)),2);
710 D=D+SS : IF D >= 8 THEN SS=-2 ELSE IF D < 1 THEN
SS=2 ELSE IF RND(3) = 2 THEN SS=-SS
720 A=64 : FOR X=1 TO 5 : PRINT @ A+D, G$(X); :
A=A+128 : NEXT X
730 PRINT @ 974, "PRESS '1' TO PLAY AGAIN OR '2' TO END"; :
PRINT @ 731, "HIGH SCORE"; : PRINT @ 792, "-.-=<";
STRING$(7-LEN(STR$(HS)),48); MID$(STR$(HS),2); ">=-.-";
740 PRINT @ 25, STRING$(17," "); : FOR X=1 TO 100 : NEXT
750 I$=INKEY$ : IF I$ = "1" THEN 30 ELSE IF I$ = "2"
THEN CLS : END
760 PRINT @ 25, "G A M E O V E R"; : GOTO 710
770 FOR TY=RND(PK) TO 9 : IF MID$(G$(MM),3+(TY-1)*6,5) =
STRING$(5,128) THEN VF=RND(4) : GOTO 780 ELSE NEXT : RETURN
780 FOR RE=768 TO MM*128 STEP -128 : PRINT @ RE+VF, F$; :
HN=6 : H1=1 : GOSUB 540 : H1=0 : PRINT @ RE+VF,
STRING$(9,128); : HN=6 : GOSUB 550 : VF=VF+RND(10) :
IF VF > 4+D+(TY-1)*6 THEN VF=VF-RND(10)
790 IF VF >= 60 THEN VF=VF-10 ELSE IF RND(2) = 2 THEN BB=7 :
GOSUB 190
800 NEXT RE : G$(MM)=LEFT$(G$(MM),1+(TY-1)*6) + MID$(F$,4,6) +
MID$(G$(MM),8+(TY-1)*6) : BB=7 : GOSUB 190 : T0=T0+1 : RETURN

```

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DISK DRIVE WOES?  
PRINTER INTERACTION?  
MEMORY LOSS?  
ERRATIC OPERATION?

## Don't Blame The Software!



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# GRAPHICS TEXT PRINTING PROGRAM

Joseph Rosenman

There are two types of printers in the world of small computers: high quality (and expensive), and "the others". In the April issue of **Computronics**, I described the EPSON MX-80 printer. I believe that the MX-80 is significantly better than any other inexpensive printer, and that many TRS-80 users will elect to purchase it. With this in mind, I have written a special "art border" text printing program for the MX-80. It should be possible to modify the program to run on other printers that support TRS-80 graphics, but the high resolution print commands would need to be removed.

This program prints some text, surrounded by a graphics border. The "box" (containing the text within the graphics borders) will be centered on the page. The text within the box will also be centered (based on the longest line). There are three ways to access text to be printed. The first way is to enter it directly into the program (by adding it to the source code). The program listing contains a twelve line text as an example. The second way is to enter text via the program. This method requires that you specify the number of lines first. The program will permit commas, colons, etc. It is possible to save code entered during execution (or from the program itself) onto disk. The third method is to read a disk file (saved from a previous run). The program is self-documenting. Every step offers a limited number of choices (with most incorrect choices ignored). The printer should be in standard mode for this program to run. (Set dip switch 2-3 "on", and 2-4 "off".)

The program assumes a paper size of 9.5 by 11 (or 8.5 by 11 without side tear-offs). This means that there are 66 lines per page — the standard. Any variations from the standard might require program modifications. The maximum line length is 61 characters. If any line larger is entered, the program will identify it, then enter into the edit mode. Edit mode permits modification of the text in the program buffer. From edit mode, it is possible to insert lines, remove lines, replace lines, list text, or test text. The program will not allow a return from edit mode unless the text passes the length test. (Edit mode is entered when errors are detected, or by the user prior to disk save and print.) The maximum number of lines is 48. The CLEAR statement reserves 2000 bytes of memory for string space (line 20). If the maximum number of lines (and line lengths) are used, there will be an "OUT OF STRING SPACE" error. The program could (conceivably) use as much as 4000 bytes. Most programs will run just fine as it is. If you should enter an unusually large text, you might want to increase the value in the

CLEAR statement. The program permits the specification of a graphics border. The top and bottom use an A-B pattern (the default graphics are 173 and 179). The sides use an A-B-A pattern (the default graphics are 158, 179, and 158). If you look into the program, you won't find the same numbers as presented here. The reason for this is that the EPSON printer uses different ASCII codes for graphics, when in the standard mode. The graphics codes will automatically be shifted upon entry. The borders use the 40 cpl print mode, while the text uses the standard (80 cpl). All characters overstrike and double print. FAIR WARNING — it takes a long time to print!

In addition to the GRPHPRNT program, there is a short program called TEXTPRNT. TEXTPRNT will take a data file created by GRPHPRNT, and print it in the normal fashion. This allows you to get quick copies of whatever text you are working with in about one tenth of the time. While GRPHPRNT is a "fancy" program, TEXTPRNT is very cut and dried. TEXTPRNT requires no special instructions.

There are a couple of additional facts about the EPSON MX-80 that I wish to relate. When I first began to write this program, I intended that it handle text up to a length of 98. It would handle this by switching from 66 CPL mode to 80 CPL mode or to 132 CPL mode. I decided to abandon this, though, when I discovered that the emphasized and double print modes won't work in either 66 or 132 CPL mode. Also, you can't switch in and out of 132 CPL mode on the same line. These are unfortunate limitations that users should be aware of. Although the printer versatility would benefit from the addition of these missing features, I want to emphasize that this is a FINE, low priced printer.

Postscript: At the TRS-80 show held at the Statler-Hilton in New York this May, I learned of some new EPSON printers that are being released. A new version of the MX-80 has been released which includes friction feed along with the standard tractor feed (MX-80FT). There is also a new printer, the MX-100, that can handle paper widths of upto fifteen inches (the MX-80 can handle ten inches). Both the new MX-80 and the MX-100 use the same ROMs as the original MX-80, so they are completely compatible. I understand that the MX-100 has a suggested retail price of about \$950.00 (the MX-80 retails for \$645.00). I don't know the price for the friction feed MX-80. (I believe that the MX-100 will be available after the summer.) The MX-100 is said to have the friction feed as a standard option, but we can't be sure of that until they

are generally available. I have also seen an upgrade for \$75.00 that converts the MX-80 to "FT". Unfortunately, I believe that this option removes the adjustable tractors (or so the advertisement implies). I don't think the EPSON MX-80FT has the adjustable tractors removed. If any readers have had any first hand experience with the upgrade kit, why not write to **H & E Computronics** and let us know the details.

```

10 REM GRAPHIC PRINT PROGRAM BY JOSEPH ROSENMAN 6/81.
20 CLS : CLEAR 2000 : DEFSTR A-G,W : DEFINT H-V,X-Z
30 I=0 : DIM A(49) : D2=STRING$(63," ")
40 E=CHR$(14) : E1=CHR$(20) : E2=CHR$(27) : F=" "
50 FOR I=1 TO 25 : READ I2 : D3=D3+CHR$(I2) : NEXT I
60 REM
70 CLS : GOSUB 170 : ' INTRODUCTION ROUTINES.
80 CLS : GOSUB 830 : ' TEXT ROUTINES.
90 CLS : GOSUB 550 : ' PRINT ROUTINES.
100 REM
110 REM CONCLUSION OR REPRINT.
120 CLS : I=H+6 : PRINT @ 22, I; "LINES PRINTED"
130 PRINT STRING$(64,CHR$(143)) : PRINT @ 342, "PRINT AGAIN?
(Y/N) ";
140 D=INKEY$ : PRINT D; : IF D = "" GOTO 140
150 IF D = "Y" GOTO 90 ELSE IF D = "N" PRINT @ 512, "Program
completed" : END
160 GOTO 140 : ' BAD INPUT.
170 REM
180 REM INTRODUCTION AND TITLES
190 REM
200 PRINT @ 76, " * * * Graphic Print Program * * *"
210 PRINT @ 155, "for the" : PRINT @ 213, "EPSON MX-80 Printer"
220 PRINT @ 341, "by Joseph Rosenman"
230 PRINT : PRINT STRING$(64,CHR$(143))
240 PRINT @ 907, "copyright (c) 1981 by J. Rosenman";
250 PRINT @ 602, D3 : ' GRAPHICS SYMBOL.
260 FOR I=1 TO 1000 : NEXT I : PRINT @ 896, D2;
270 PRINT @ 968, STRING$(46,CHR$(127));
280 PRINT @ 910, "Would you like instructions (Y/N)";
290 D=INKEY$ : PRINT @ 945, D; : FOR I=1 TO 100 : NEXT I
300 PRINT @ 896, D2; : FOR I=1 TO 25 : NEXT I
310 IF D = "Y" GOTO 340
320 IF D = "N" RETURN ELSE GOTO 280
330 REM
340 CLS : ' PRINT INSTRUCTIONS
350 REM
360 PRINT STRING$(64,CHR$(143));
370 PRINT " The Graphic Print Program allows you to print
a poem or text"
380 PRINT " on an EPSON MX-80 printer. The text is
surrounded by a"
390 PRINT " graphics border (user selectable). To use
this program,"
400 PRINT " your MX-80 must be set to the -> STANDARD <-
dip switch"
410 PRINT " configuration. If you wish to enter your
own border"
420 PRINT " graphics, use the STANDARD TRS-80 graphics
codes. The"
430 PRINT " program will center the text. The text must
be under 49"

```

```

440 PRINT " lines, with a line length under 62. The
text could be"
450 PRINT " edited into this file, entered under program
control, or"
460 PRINT " accessed from disk. If edited into the
program, it must"
470 PRINT " be stored in the 'A' array (located at
line # 2630)."
480 PRINT " The variable 'H' must be set to the number
of lines of"
490 PRINT " text (line # 2610) when text is edited into
the program."
500 FOR I=1 TO 14 : REM VIDEO BORDER
510 PRINT @ I*64, CHR$(149); : PRINT @ (I+1)*64-1, CHR$(170);
520 NEXT I : PRINT @ 960, STRING$(63,CHR$(188));
530 PRINT @ 900, " TYPE <ENTER> WHEN READY TO CONTINUE ";
540 D=INKEY$ : IF D = CHR$(13) RETURN ELSE GOTO 540
550 REM
560 REM PRINT ROUTINE.
570 REM
580 REM PRINT INITIALIZATION
590 D2=STR$(H)+" LINES TO PRINT"+STRING$(50," ") : PRINT
600 PRINT A(1) : PRINT STRING$(64,CHR$(140)) : PRINT
610 PRINT @ 346, D3
620 PRINT @ 792, "READY PRINTER"
630 PRINT @ 978, "( Type <Q> to abort. )";
640 D=INKEY$ : PRINT @ 414, " "; : FOR I2=1 TO 20 : NEXT I2
650 PRINT @ 414, CHR$(140); : FOR I2=1 TO 25 : NEXT I2 :
IF D = "" GOTO 640
660 IF D = "Q" PRINT @ 512, " * * * RUN ABORTED * * *" : END
670 REM
680 CLS : J=(66-(H+12))/2 : FOR I=1 TO J : LPRINT : NEXT I
690 LPRINT E2+"E"; E2+"G" : PRINT H; "LINES TO PRINT"
700 Z=(64-J1)/2
710 W=STRING$(Z," ") : REM LEFT MARGIN VALUE.
720 REM PRINTER IS NOW INITIALIZED AND POSITIONED.
730 LPRINT E; F; C : LPRINT E; F; C
740 LPRINT E; F; B; TAB(38); B : LPRINT E; F; B; TAB(38); B
750 FOR I=1 TO H : D=STRING$(64-(LEN(A(I))+LEN(W))," ")
760 LPRINT E; F; B; E1; W; A(I); D; E; B : REM PRINT TEXT.
770 PRINT @ 960, "" : PRINT @ 960, A(I);
780 PRINT @ 0, D2 : PRINT @ 56, "LINE"; I : NEXT I
790 LPRINT E; F; B; TAB(38); B : LPRINT E; F; B; TAB(38); B
800 LPRINT E; F; C : LPRINT E; F; C
810 LPRINT CHR$(12) : REM ISSUE FORM FEED.
820 RETURN
830 REM
840 REM TEXT PROCESSING ROUTINES * * *
850 REM
860 REM TEXT INITIALIZATION
870 ' GRAPHICS MUST HAVE 32 ADDED FOR MX-80 STANDARD MODE.
880 B=CHR$(190)+CHR$(211)+CHR$(190) : REM SIDE BORDER GRAPHIC.
890 B1=CHR$(158)+CHR$(179)+CHR$(158)
900 D=CHR$(205)+CHR$(211) : D1=CHR$(173)+CHR$(179) :
' TOP/BOTTOM.
910 PRINT @ 788, "Default graphics";
920 FOR I2=1 TO 12 : DD=DD+D1 : NEXT I2
930 PRINT @ 592, DD; : PRINT @ 656, DD;
940 PRINT @ 720, B1; : PRINT @ 784, B1; : PRINT @ 848, B1;
950 PRINT @ 741, B1; : PRINT @ 805, B1; : PRINT @ 869, B1;
960 PRINT @ 848, DD; : PRINT @ 912, DD;

```

```

970 PRINT @ 0, "WHAT ARE THE GRAPHIC CODES FOR THE SIDE BORDERS"
980 INPUT "(FOR THE DEFAULT OF 158 & 179, TYPE ENTER)"; M,N
990 PRINT : IF M = 0 GOTO 1010 ELSE M=M+32 : N=N+32
1000 B=CHR$(M)+CHR$(N)+CHR$(M) : M=0 : N=0
1010 PRINT "WHAT ARE THE GRAPHIC CODES FOR THE TOP & BOTTOM"
1020 INPUT "(FOR THE DEFAULT OF 173 & 179, TYPE ENTER)"; M,N
1030 CLS : IF M=0 GOTO 1050 ELSE M=M+32 : N=N+32
1040 D=CHR$(M)+CHR$(N) : PRINT
1050 FOR I=1 TO 19 : C=C+D : NEXT I : REM CREATE LINES.
1060 REM
1070 CLS : PRINT TAB(20); "SELECT OPTION NUMBER"
1080 PRINT STRING$(63,CHR$(140))
1090 PRINT CHR$(191); " 0) QUIT"; TAB(37);
"1) READ IN DISK FILE"; TAB(62); CHR$(191)
1100 PRINT CHR$(191); " 2) ENTER TEXT"; TAB(37);
"3) USE TEXT IN PROGRAM"; TAB(62); CHR$(191)
1110 PRINT STRING$(63,CHR$(140))
1120 PRINT @ 794, D3
1130 PRINT @ 410, STRING$(3,CHR$(157));" ? ";
STRING$(3,CHR$(174));
1140 D=INKEY$ : IF D < " " PRINT @ 538, "OPTION ";D; :
IF D > "3" PRINT " ???";
1150 FOR I2=1 TO 100 : NEXT I2 : PRINT @ 414," ";
1160 FOR I2=1 TO 66 : NEXT I2 : PRINT @ 414,"?";
1170 IF D = " " GOTO 1140 ELSE I=VAL(D) : IF I < 0 OR I > 3
THEN PRINT @ 538, STRING$(12," ") : GOTO 1140
1180 IF D = "0" THEN PRINT @ 512, "PROGRAM TERMINATED" : END
1190 IF I < 1 OR I > 3 THEN PRINT @ 538, STRING$(12," ") :
GOTO 1140
1200 CLS : ON I GOSUB 1420, 2490, 2600
1210 GOSUB 1490 : PRINT "MAXIMUM LINE LENGTH IS: ";J1
1220 PRINT " * * * TEXT LENGTH TEST CONCLUDED * * *"
1230 REM
1240 PRINT @ 458, "DO YOU WISH TO ENTER EDIT MODE? (Y/N) ";
1250 D=INKEY$ : PRINT D; : IF D = " " GOTO 1250
1260 IF D < "N" AND D < "Y" GOTO 1250
1270 IF D = "Y" GOSUB 1650 : GOSUB 1490
1280 REM
1290 CLS : PRINT "DO YOU WANT TO SAVE THE TEXT TO DISK (Y/N)?";
1300 PRINT @ 602, D3 : PRINT @ 46, " ";
1310 D=INKEY$ : PRINT D; : IF D = " " GOTO 1310
1320 IF D = "Y" GOSUB 1350 ELSE IF D < "N" GOTO 1310
1330 CLS : RETURN : ' TEXT ROUTINE COMPLETED, BACK TO MAIN.
1340 REM
1350 REM DISK WRITE ROUTINE.
1360 PRINT @ 448, "WHAT IS THE OUTPUT FILESPEC"; :
LINE INPUT "? "; D
1370 OPEN "O",1,D : PRINT#1, H
1380 FOR I=1 TO H
1390 PRINT#1, A(I) : PRINT @ 512, A(I); D2 : NEXT I
1400 PRINT#1, CHR$(0) : ' TO MAKE INTO PENCIL TYPE FILE.
1410 PRINT "FILE SAVED" : CLOSE 1 : RETURN
1420 REM DISK READ ROUTINE.
1430 PRINT "WHAT IS THE INPUT FILESPEC"; : LINE INPUT "? "; D
1440 OPEN "I",1,D : INPUT#1, H
1450 FOR I=1 TO H : LINE INPUT#1, A(I)
1460 PRINT @ 512, A(I); D2 : NEXT I : PRINT "FILE READ,";
1470 PRINT H; "LINES OF TEXT" : CLOSE 1 : RETURN
1480 REM
1490 REM TEXT LINE LENGTH TEST.
1500 J1=0 : G=" " : ' INITIALIZE MAX LINE LENGTH & ERROR CODE.
1510 FOR I=1 TO H

```

```

1520 J=LEN(A(I)) : IF J > 61 GOSUB 1630 : REM ERROR TRAP.
1530 IF J > J1 THEN J1=J : REM FIND LARGEST LINE LENGTH.
1540 NEXT I
1550 IF J1 < 62 THEN RETURN : REM NO PROBLEMS.
1560 REM
1570 REM ERROR TRAP CODE.
1580 G="ERRORS FOUND! " +CHR$(13)+G : PRINT G
1590 PRINT : PRINT "GOING INTO EDIT MODE . . ." : FOR I=1 TO 900
1600 NEXT I : GOSUB 1650 : GOTO 1490 : ' EDIT, THEN TEST.
1610 REM
1620 REM ERROR MESSAGE GENERATOR
1630 G=G+"LINE"+STR$(I)+"="+STR$(J)+" CHRS."+CHR$(13) : RETURN
1640 REM
1650 REM TEXT EDITOR ROUTINE
1660 REM
1670 C1="EDIT MODE: Menu"+ STRING$(10," ") + "<File contains"
+F +F + " lines of text.">+CHR$(13)
1680 C2=" 0) QUIT 1) LIST FILE
2) REPLACE LINE"+CHR$(13)
1690 C3=" 3) DELETE LINE 4) ADD LINE
5) TEST FILE"+CHR$(13)
1700 C4=STRING$(19," ")+"6) CONCLUDE EDITING"+CHR$(13)
1710 C5=STRING$(63,CHR$(131))+CHR$(13)
1720 C6=STRING$(3,CHR$(153))+ " ? "+STRING$(3,CHR$(166)) : CLS
1730 PRINT @ 0, C1;C2;C3;C4;C5
1740 PRINT @ 41, H; : PRINT @ 346, C6
1750 D=INKEY$ : PRINT @ 414, D; : FOR I2=1 TO 90 : NEXT I2
1760 PRINT @ 350, CHR$(127); : L=I2/2 : PRINT @ 350," ";
1770 FOR I2=1 TO 50 : NEXT I2 : PRINT @ 350, " ? ";
1780 IF D = " " GOTO 1750 ELSE L=VAL(D) : IF L < 0 OR L > 6
THEN GOTO 1750
1790 IF D = "0" THEN PRINT @ 512, "PROGRAM TERMINATED" : END
1800 ON L GOTO 1820,1940,2070,2180,2300,2420
1810 GOTO 1750 : ' BAD INPUT
1820 REM LIST FILE ROUTINE.
1830 CLS : PRINT C1;C5 : PRINT @ 41, H; : PRINT @ 12, "List";
1840 PRINT @ 192, " "; : FOR I=1 TO H STEP 10
1850 FOR J=0 TO 9 : IF I+J > H GOTO 1910
1860 PRINT I+J; " "; A(I+J) : NEXT J
1870 PRINT @ 962, "(TYPE <ENTER> FOR ADDITIONAL LINES)";
1880 D=INKEY$ : IF D = " " OR D < CHR$(13) THEN GOTO 1880
1890 CLS : PRINT C1;C5 : PRINT @ 41, H;
1900 PRINT @ 12, "List"; : PRINT @ 192, " ";
1910 NEXT I : PRINT @ 962, "(TYPE <ENTER> TO CONTINUE)";
1920 D=INKEY$ : IF D = " " OR D < CHR$(13) THEN GOTO 1920
1930 GOTO 1720 : ' RETURN TO EDIT MAIN.
1940 REM ENTRY FOR REPLACE ROUTINE
1950 CLS : PRINT C1;C5 : PRINT @ 41, H; : PRINT @ 12, "Replace";
1960 PRINT @ 384, "WHAT LINE DO YOU WISH TO REPLACE";
1970 INPUT L : IF L < 1 OR L > H GOTO 1970
1980 PRINT @ 704, "Old line:" : PRINT @ 768, A(L)
1990 PRINT @ 960, "WHAT IS THE NEW LINE?";
2000 PRINT @ 832, " " : LINE INPUT A(L)
2010 PRINT "LENGTH OF NEW LINE IS: "; LEN(A(L));
2020 PRINT @ 384, STRING$(63," ");
2030 PRINT @ 384, "DO YOU WISH TO REPLACE ANOTHER LINE?
(Y/N) ";
2040 D=INKEY$ : PRINT D; : IF D = " " GOTO 2040
2050 IF D = "Y" GOTO 1950 ELSE IF D < "N" GOTO 2040
2060 CLS : GOTO 1730 : ' RETURN TO EDIT MAIN.

```

continued on page 42

# TEST QUESTIONS

Gordon Speer

In the teaching of BASIC programming there is a need for short test questions which require specific programming skills at each level of development throughout the course. For those of you who are either students or teachers I am printing some of my favorite questions and answers this month. I will send a small prize to the person who submits the best test question to me in the next three months, and will publish a variety of the ones submitted.

## LABELS

Write a BASIC program which will print your name and address continuously in a six-line cycle to fit one inch mailing labels. Insert a delay loop of 1000 counts to slow the screen printer and make the display easier to read.

This problem uses PRINT lines for both text and spacing. It also makes use of the GOTO and a simple FOR-NEXT loop.

```
100 ' LABELS
110 PRINT "THOMAS ALVA EDISON"
120 PRINT "EDISON LABORATORY"
130 PRINT "MENLO PARK, NEW JERSEY"
140 PRINT
150 PRINT
160 PRINT
170 FOR X=1 TO 1000:NEXT X
180 GOTO 110
```

## PIZZA

Write a BASIC program which will find out which is the best bargain in our local pizza place. They serve five sizes of pizza as follows: the regular seven inch size for \$1.50, the large nine inch for \$2.40, the giant ten inch size for \$3, the family size thirteen inch for \$5.50, and the hungry-teenager special sixteen inch for \$8. You should first find the area of the pizza using the circle area formula  $A = \pi \times r^2$ , then print a table showing the diameters, areas, prices, and area/\$ of each of the five sizes.

This problem makes use of READING-DATA, calculation using multiplication, division, exponentiation, PRINTing in four columns with column headings, and an out of data test to prevent an out of data error.

```
100 ' PIZZA
110 DATA 7,1.50
120 DATA 9,2.40
130 DATA 10,3
140 DATA 13,5.50
150 DATA 16,8
```

```
160 DATA 0,0
170 PRINT
180 PRINT "DIAMETER","AREA","PRICE","AREA/PRICE"
190 PRINT
200 READ D,P           'DIAMETER, PRICE
210 IF P=0 THEN END     'OUT OF DATA TEST
220 LET A=3.14*(D/2)^2  'AREA OF PIZZA IN SQUARE INCHES
230 PRINT D,A,P,A/P
240 GOTO 200
```

## DIVING

Write a BASIC program which will calculate the scores in a diving competition. Each dive is assigned a degree of difficulty ranging from 1.0 for the bellyflop, to 3.0 for the triple twisting back somersault in the layout position. Five judges score the dives and assign up to 6.0 points each. The highest and lowest scores are discarded and the remaining three are totaled and multiplied by the degree of difficulty to determine the score for the dive.

This problem uses INPUT statements and a FOR-NEXT loop to count the five judges. A simple totaling step in line 230 and a short routine to find the highest and lowest judge's score complete the essentials. Line 140 is essential to preset the low score comparison L to a high value. It is not necessary to similarly preset H to a low value unless, in some application, the high might be below zero (as in winter temperatures), since H has a value of zero at the beginning of the program like all variables.

```
100 ' DIVING
110 CLS:PRINT CHR$(23) 'CLEAR SCREEN, WIDE LETTERS
120 PRINT
130 INPUT "DEGREE OF DIFFICULTY ";D
140 LET L=100           'PRESET LOW SCORE COMPARISON, HIGH
150 PRINT
160 FOR J=1 TO 5        'COUNTS THE JUDGES
170 PRINT "SCORE FROM JUDGE #";J;
180 INPUT S(J)
190 IF S(J) > L THEN 210
200 LET L=S(J)          'NEW LOWEST SCORE
210 IF S(J) < H THEN 230
220 LET H=S(J)          'NEW HIGHEST SCORE
230 LET T=T+S(J)
240 NEXT J
250 LET S=D*(T-L-H)     'COMPUTES THE SCORE
260 PRINT               'SPACE
270 PRINT "SCORE=";S
280 PRINT
290 INPUT "(ENTER) TO RUN AGAIN";Q
300 RUN
```

## PAYROLL

Write a BASIC program which will read employees' names and hourly rates of pay from a DATA statement, allow you to enter their weekly hours worked on the screen, and calculate their weekly pay, allowing time-and-a-half for all hours over forty for the week. This program should also accumulate company totals for hours, overtime hours, and gross pay and display these after the last employee's pay has been calculated.

This is a very straightforward program, particularly suited to a lesson in flowcharting. Students are encouraged to put their friends on a payroll, and decide how much to pay them. Notice that in line 150 the overtime hours are reset to prevent a less-than-forty-hour employee from receiving the overtime hours of the previous overtime employee.

```

100 ' PAYROLL
110 DATA SMITH,MARVIN,4.30,ANDERSON,MARSHA,5.20
120 DATA FORD,SAMUEL,5.15,YOUNG,RALPH,6.05
130 DATA OUT,OF,0
140 CLS 'CLEAR SCREEN
150 LET OH=0 'RESET OVERTIME HOURS TO ZERO
160 READ L$,F$,R 'LAST NAME, FIRST NAME, HOURLY RATE
170 IF R=0 THEN 310 'OUT OF DATA TEST
180 PRINT
190 PRINT "HOW MANY HOURS THIS WEEK FOR ";
200 PRINT F$ "L$";
210 INPUT H
220 LET TH=TH+H 'TOTAL HOURS - ALL EMPLOYEES
230 IF H < =40 THEN 270
240 LET OH=H-40 'OVERTIME HOURS
245 'NOTE 'TO' CANNOT BE USED AS A VARIABLE - IT'S A
BASIC WORD
250 LET OT=OT+OH 'TOTAL OVERTIME HOURS - ALL EMPLOYEES
260 LET H=40 'REGULAR HOURS
270 LET P=R*(H+1.5*OH) 'PAY
280 PRINT "WEEKLY GROSS PAY ="P
290 LET TP=TP+P 'TOTAL PAY - ALL EMPLOYEES
300 GOTO 150
310 PRINT
320 PRINT
330 PRINT,"COMPANY TOTALS"
340 PRINT "TOTAL HOURS ="TH
350 PRINT "TOTAL OVERTIME HOURS ="OT
360 PRINT "TOTAL PAY ="TP

```

## CITYSORT

Write a BASIC program which will READ the names of thirty cities from DATA statements, sort them in alphabetical order, and print them in four columns with the names in order vertically down the first column, then the second column, etc.

The tricky part of this problem is not the sort routine, which is a typical bubble-sort, but the function in line 420 which generates subscripts for the variable from the line and column numbers to accomplish the assigned print format. Note that eight lines of four

columns will print thirty-two positions, the last two of which are nulls since only thirty names were read. To prevent printing the dummy data, it must be changed to a null (line 230).

```

100 ' CITYSORT
110 DIM C$(50) 'VARIABLES WITH SUBSCRIPTS > 10 MUST BE
DIMENSIONED
120 DATA CINCINNATI,CLEVELAND,BALTIMORE,WASHINGTON,BOSTON
130 DATA NEW YORK,BUFFALO,ATLANTA,DALLAS,HOUSTON,CHICAGO
140 DATA INDIANAPOLIS,NASHVILLE,KANSAS CITY,ST LOUIS
150 DATA DENVER,MINNEAPOLIS,DES MOINES,MILWAUKEE,LOS ANGELES
160 DATA SALT LAKE CITY,SAN FRANCISCO,PORTLAND,SEATTLE
170 DATA HONOLULU,OMAHA,TOPEKA,SAN ANTONIO,MIAMI,TAMPA
180 DATA OUTOF
190 LET N=N+1 'INCREMENT THE SUBSCRIPT
200 READ C$(N) 'CITY NUMBER N
210 IF C$(N)="OUTOF" THEN 230
220 GOTO 190 'READ ANOTHER NAME
230 LET C$(N)=" 'CHANGES DUMMY 'OUTOF' TO NULL
240 LET N=N-1 'CORRECTS CITY COUNT
250 PRINT "THERE ARE"N"CITIES IN THE DATA"
260 'SORTING STARTS HERE
270 FOR I=1 TO N-1 'NUMBER OF TIMES THROUGH THE LIST
280 FOR J=1 TO I 'NUMBER OF PLACES DOWN THE LIST
290 IF C$(J) < C$(J+1) THEN 330 'THEY ARE IN THE CORRECT ORDER
300 LET T=C$(J) 'TEMPORARY STORAGE
310 LET C$(J)=C$(J+1) 'MOVE UP
320 LET C$(J+1)=T 'MOVE DOWN
330 NEXT J
340 NEXT I
350 'SORTING IS COMPLETE
360 CLS 'CLEAR SCREEN
370 PRINT
380 PRINT," C I T I E S "
390 PRINT
400 FOR L=1 TO 8 'LINES
410 FOR K=1 TO 4 'COLUMNS
420 PRINT C$(L+8*(K-1)),
430 NEXT K
440 NEXT L
450 PRINT
460 PRINT

```

Gordon Speer  
3304 Woodlawn Road  
Sterling, IL 61081

*continued from page 14*

Now that we have had a chance to use it on the Model III, we are delighted with its improved performance. The Model III's video display is much more pleasing to spend hours in front of, and it is automatically upper/lower case. The left shift key functions as the shift key, while the right shift key is the control key, so no computer modifications are necessary.

Computronics now has copies of this program, which they will sell for \$19.95.

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# BEGINNER'S CORNER

A. Douglas Werbeck

## ELEMENTARY ARRAYS (PART V)

Yes sir and yes ma'am, you are sitting in on Beginner's Corner #TWELVE. One year has passed since my original August 1980 column entitled "THE MEGABYTE GAP." That column outlined my opinions on the shortcomings of TRS-80 teaching materials available at that time. It was my feeling that most of the teaching authors wrote from the mental level of a mainframe computer. "Mainframe," for those that are unfamiliar with that word, is the term applied to the really large computers used in banks, government and TPC (the phone company). Right there, written before me on my SCRIPSIT video, is an example of the very subject I am describing. I am talking about the fact that I stopped in the middle of my text to explain the term "mainframe" to the uninitiated. My gripe against the majority of teaching authors one year ago was that they "assumed" a level of knowledge or a known set of computer buzzwords on the part of the reader. "Buzzword" is computerese for "slang." A couple of issues ago I submitted an original manuscript to the very learned COMPUTRONICS powers that be, and when the column was printed, I noticed that someone had gone and changed my computerese to "computerese." They were not challenging my spelling this time (it is always perfection of course), they inserted quotes around computerese to indicate to the readership that it was a non-standard word, not to reach for Mr. Webster for a definition. Of course, to me "computerese" refers to that special language our computing forefathers originated. I certainly did not originate the word, but I do use it freely. It's nice to see that the COMPUTRONICS editorial powers are as conscientious of the plight of the Beginner as of this author's intentions!

In summary, I felt that the well meaning, learned authors attempting to teach TRS-80 Beginners had trouble communicating. I purchased a book back then whose title was ".... for BEGINNERS." (I am withholding the name of the book.) I was lost past page 7! It was obvious to me when the author said "for Beginners," he was talking about Beginners to that particular AREA of computing, NOT Beginners to computing! It made me wonder whether I was intentionally misled to sell books! On the other hand, I think there is the sad possibility that the author had forgotten that people are not born onto this earth with a knowledge in electronic computing! Unlike newborn spiders so expert in web spinning, TRS-80 owners come into this world kicking and yelling at ground zero!

Well, here we are a year from that column, so I took some time to reflect before writing this column. How do we stand? I would say MUCH better! Not great, but MUCH better. My new Model III came with three books, GETTING STARTED WITH TRS-80 BASIC, TRS-80 MODEL III - Operation and BASIC Language

Reference Manual, and the DISK SYSTEM OWNER's MANUAL, a slightly unusual preliminary version that is missing pages. I think it would be safe to say, in general terms, that whatever level of computer expertise was held by a new owner, these books would do nicely in the support of the equipment. Of course, if I had my drothers, I would change a handful of things, but overall, I think RS has done an excellent job of delivering this very complex state-of-technology machine with more than adequate documentation.

I am not saying that I feel the subject of TRS-80 microcomputer education is well covered in general. Even more emphatically, I am not saying BOOKS have it "covered." If you haven't noticed, things out there in microcomputer land are changing at an incredible rate of speed. If you have the opportunity to look through some electronic oriented magazines from say, 1975-76, just FIVE years ago, let yourself be overwhelmed by the ancient, computer offerings. Back to the subject of books, by the time a book gets written, edited, printed, distributed and read, there is a very good chance that things have changed significantly! And, of course, that leads up to a TRS-80 adage, "computer people cannot exist on books alone." Subscribing to a magazine, especially the one that is published monthly from Spring Valley, New York, can do a lot in keeping you abreast of the latest events and techniques. Why, it even has a crystalline device that predicts future happenings! Before you go and think me biased, let me say that my editor, Dr. Howe, gives me free rein in my offerings. He does not direct the column content nor steer my viewpoints, and I can honestly say that after a year's association with our publisher, Howard Gosman, he has impressed me as a man whose objectives, in operating H&E COMPUTRONICS, are honest and of the best intention. I say, a truly outstanding group of people to work with as an author and a most reputable organization to patronize as a consumer. Enough birthday cake!

Before we get back to the amazing arrays, I would like to present an interesting concept for your consideration. This is a Beginner's Corner column. It is aimed at the Beginner, it is meant to fuel the Beginner's appetite for continuing knowledge in the fascinating world of TRS-80's. Remember the pioneer that "had" to know what was on the other side of the proverbial hill? Well that's what I mean to show the Beginner -- not necessarily how far into the esoteric one can take this subject, but to illustrate to the newcomer that furthering his or her venture into TRS-80dom need not be a complicated or frustrating experience. It can and needs to be a pleasureable voyage.

In writing a column for Beginners, the question arises whether to continue to build on previous

columns, sort of in a classroom type of fashion, or to begin each column at ground zero. After a year's worth of columns I wonder how many of my original followers are still with me? Shall I write for them or for the first time reader? I am presenting these questions not to merely encourage mail, which is always welcome, but to divulge some of the thought and areas for decisions that support the subject matter for this column. I have tried to present material that will keep the Beginner coming back for more, and give the person who is a step beyond Beginner some food for thought. If you have feelings on this subject, please feel free to communicate with me. Communication channels are listed at the end of this column.

Ok, now back to arrays, before the title of this column becomes inappropriate. Let me start by correcting an error in the May issue on page 14, upper right hand corner. An array that has three dimensions such as (9,9,9), has ONE THOUSAND available positions, NOT 729. (A momentary, unthinking, space-out on my part!) One month later, at the time of the June issue writing, I was still unaware of this error in the May issue. But in the June issue, I did review the 9x9x9 array and correctly stated that there were 1000 available positions. Now that I have corrected the readership masses, you strange egg-shaped, blue glowing object that has been hovering over my home at night, please leave! You readers can sure turn into an ugly mob!

Recapping our last known learned position in the galaxy, we had discussed three popular, practical methods for loading numerical arrays. They were: (1) line input by operator, (2) having the program read them into positions from data statements contained in the program, and the most fancy, (3) having the program read them in from a source outside the computer such as from tape or diskette. Since this is a Beginner's Corner, and most of the readers have cassette systems, we'll confine our discussions to that system. Storing data on tape is a fairly simple affair, slow to store and to read back, but simple. Writing data on and reading data from a disk is very, very fast. We are comparing disk seconds to cassette minutes. However, storing data on disk is a bit more complex — actually, several bits more complex (pun intended). There are two methods for writing data on disk, one is called writing SEQUENTIAL files and the other is writing RANDOM files. I mention those two methods, not to launch a discussion into them but to familiarize you with the words so you will have some smattering of what they represent when you run across them.

If you have saved the final version of last month's program, let's load it back into the computer. That program asked the operator to input a number. The input number was then stored in an array location which could be seen on the screen. We'll now modify the program to load numbers into the array from a data statement within the program.

\* Change line 10's REM statement to:  
10 REM INPUT PROGRAM FOR AUGUST COMPUTRONICS

\* Replace lines 20, 30 and 80 with these lines:

```
20 READ A : P(B,C)=1A
30 CLS : B=B+1 : IF B>2 THEN B=0 : C=C+1
80 FOR X=1 TO 300 : NEXT X : IF C>2 GOTO 20
```

\* Add data line #100 (you may use any numbers after the DATA statement as long as they are separated by commas)

```
100 DATA 3,7,9,1,2,8
```

Your finished program needs to look like this:

```
10 CLS:DIM P(2,1):REM - INPUT PROGRAM FOR AUGUST COMPUTRONICS
20 READ A : P(B,C)=A
30 CLS:B=B+1 : IF B>2 THEN B=0 : C=C+1
40 PRINT"      0      1      2"
50 PRINT"      .      .      ."
60 PRINT"0 ) ";P(0,0);" ";P(1,0);" ";P(2,0)
70 PRINT"1 ) ";P(0,1);" ";P(1,1);" ";P(2,1): PRINT
80 FOR X=1TO300:NEXTX:IF C>2 GOTO 20
90 PRINT"ALL 6 POSITIONS HAVE BEEN FILLED - END OF PROGRAM"
100 DATA 3,7,9,1,2,8
```

Now RUN it and have some fun watching the program load the six array positions!

Let's review what's happening. Since I prefer working with the low order (A,B,C, etc.) alphabetical variables, because they feel friendly, I have used the numeric variables A and B once again, but differently in this program than in the last version. I mention that to avoid any confusion as to their purpose in this program.

Line 20 READs the first DATA statement it encounters, line 100. Since The READ statement only instructs it to read one numeric variable, "A", it reads one data entry, the number 3. The program then goes to line 30 where the variables A or B are increased in value by "1" each time the program passes through line 30. This allows the variables A and B, representing array storage location elements, to be changed and therefore accomodate new entries. The program then goes on to print an array chart on your video using lines 30 to 70. When it gets to line 80 it encounters a delay loop. This FOR X = 1 TO 300 : NEXT X, simply slows down the program so you can watch the numbers being placed into various array locations on your video. If you like, try changing the 300 to something else. Lower numbers will quicken the loading, higher numbers will slow the loading. After this little delay routine, we come to the test, still on line 80, to see whether the "C" variable has gotten to be 2 yet, if it hasn't the program goes back to line 20 where it READs the next entry in the data statement. When it reads the second entry on line 100, which would be a "7", the numeric variable "A" will then equal 7. The value of "A" in READ A, line 20, will be different each time as the program READs the entries in line 100.

Want to take a little detour to illustrate a new statement we haven't covered? It is called RESTORE,

*continued on page 28*

# CALENDAR

## George Kwascha

Here is a short program designed to print a calendar. The program was run on a Model I 16K with cassette and a Radio Shack Line Printer II.

The program requires two inputs: the year and the first day of that year. The program first prompts for the year of the calendar. Enter four digits. The program then prompts for the first day of that year, which must be entered as a number from 1 to 7. The week is numbered starting from Sunday as 1 through Saturday as 7. For example, to print a calendar for 1981, enter 1981 for the year and 5 for the first day, since January 1, 1981 falls on a Thursday.

You also get a choice of double-sized (40 characters per line) or the standard 80 characters per line for printing the days in the month. And, of course, the program checks for leap years.

```

10 CLEAR 200 : CLS : PRINT STRING$(64,191);STRING$(64,143)
20 PRINT @ 144,"* * * CALENDAR PROGRAM * * *"
30 PRINT STRING$(64,188);STRING$(64,191)
50 DEFINT I,J,K,L: DEFSTR M: DEFDBL D: DIM DM(13),M(12),L(50)
100 REM READ NUMBER OF DAYS IN EACH MONTH
110 FOR I=0 TO 12 : READ DM(I) : NEXT
120 DATA 0,31,28,31,30,31,30,31,31,30,31,30,31
140 REM READ NAMES OF EACH MONTH
150 FOR I=1 TO 12 : READ M(I) : NEXT
160 DATA JANUARY,FEBRUARY,MARCH,APRIL,MAY,JUNE,JULY,AUGUST,
SEPTEMBER,OCTOBER,NOVEMBER,DECEMBER
200 REM USER INPUTS YEAR AND FIRST DAY OF YEAR
210 INPUT "ENTER YEAR OF CALENDAR (YYYY)";Y
220 PRINT "ENTER FIRST DAY OF YEAR..."
230 PRINT "TYPE 1-SUNDAY TYPE 4-WEDNESDAY TYPE 6-FRIDAY"
240 PRINT "TYPE 2-MONDAY TYPE 5-THURSDAY TYPE 7-SATURDAY"
250 PRINT "TYPE 3-TUESDAY":INPUTDW
260 REM CHECK FOR LEAP YEAR
270 A=Y : A=A/4 : IF A=INT(A) THEN DM(2)=29
290 INPUT "DO YOU WISH DOUBLE-SIZE PRINT? (Y-YES OR N-NO)";X$
300 REM CALCULATE FIRST DAY OF MONTH AND PRINT MONTH
310 FOR K=1 TO 12
320 DW=DW+DM(K-1) : DW=DW/7 : DW=DW-INT(DW) : DW=DW*7
340 IF DW=0 THEN DW=7
345 FOR II=1 TO 3 : LPRINT " " : NEXT
350 LPRINT TAB((60-(LEN(M(K))+6))/2) CHR$(27);CHR$(14);M(K);
" ";Y : LPRINT " "
354 IF X$ <> "Y" LPRINT TAB(11) "SUN";TAB(19) "MON";
TAB (27) "TUE";TAB(35) "WED";TAB(43) "THU";TAB(51) "FRI";
TAB(59) "SAT" : GOTO 360
356 LPRINT TAB(8) CHR$(27);CHR$(14);"SUN MON TUE WED THU
FRI SAT"
360 GOSUB 500
380 NEXT
399 END
500 REM SUBROUTINE TO PRINT DAYS IN EACH MONTH
510 DM=DM(K) : J=0 : FOR II=1 TO 50 : L(II)=0 : NEXT
520 IF DW >= 1 AND DW <= 7 AND DM >= 28 AND DM <= 31 THEN
550 ELSE 700
550 FOR I=DW TO DW+(DM-1)
560 L(I)=J+1 : J=J+1

```

```

570 NEXT
600 FOR I=0 TO 5
610 LPRINT " " : LPRINT TAB(6);
620 FOR J=1 TO 7
630 L=L(7*I+J)
640 IF L > 0 THEN 645 ELSE 655
645 IF X$ = "Y" GOSUB 800 : GOTO 680
650 LPRINT USING "    ##";L; : GOTO 680
655 IF X$ = "Y" GOSUB 850 : GOTO 680
660 LPRINT TAB(6) "    ";
680 NEXT J
690 NEXT I
699 RETURN
700 PRINT "ERROR IN INPUT DATA" : RETURN
800 REM SUBROUTINES FOR DOUBLE-SIZE OPTION
810 LPRINT CHR$(27);CHR$(14); : LPRINT USING "    ##";L; : RETURN
850 LPRINT CHR$(27);CHR$(14);"    "; : RETURN
George Kwascha
8007 Mahogany Drive
Charlotte, NC 28212

```

*continued from page 27*

and it is part of the DATA and READ group of statements. When a RUNning program encounters a RESTORE statement it sends the program into an electronic state of amnesia. It forgets that it has read ANY data statements during the RUN. Try adding this line to the program:

```
25 RESTORE
```

After the program goes through line 20 and the READ statement assigns the first data entry value (3) to the numeric variable A, the program encounters a RESTORE command which causes it to forget it read anything. It doesn't forget the value it assigned to A, it merely forgets that it had any instructions to READ something. With line 25 added, when the program goes through its cycle, it keeps reREADING the first entry on the data statement which, of course, is the number 3!

Well, we have covered the second method for loading elementary array positions. If you like, save the above program and we will modify it in next month's column which will cover loading array positions from an external storage medium, cassette tape. I will also attempt to provide an explanation of STRING arrays which are capable of holding alphabetical characters and words.

Have a good, safe and healthy August!

A. Douglas Werbeck  
 POB 787  
 Ruskin, FL 33570  
 or  
 SOURCE ID# TCU318  
 CompuServe/MicroNet ID# 70270,462

# VOL. 4 - DISASSEMBLED HANDBOOK FOR TRS-80

Robert M. Richardson

## CHAPTER 5

### BAUDOT RADIO TELETYPE TRANSMIT PROGRAM

#### 60, 66, 75, AND 100 WORDS PER MINUTE

## INTRODUCTION

Teletype, as we know it today (with minor modifications) has been around almost as long as the airplane. Almost as long as trans-Atlantic radio communication, and almost as long as the massed-produced automobile.

Teletype™, (tm of the Teletype Corporation), was the natural outgrowth/evolution of Morse code telegraphic communications which Samuel Morse began work on in the mid 1830's, demonstrated to the U.S. Congress before the Civil War, and was further developed into multiplex telegraphy by General (then Captain) Squires of the U.S. Army Signal Corps. in 1901. What an amazing coincidence that all these technological advances and innovations came to pass within a very few years of each other; i.e., trans-Atlantic radio, the airplane, teletype, and the Henry Ford mass-produced automobile.

Charles Krum was the inventor of the teletype machine, circa 1905 - 1906. His financial backing was provided by Jay Morton (of Morton Salt). The company and its product were not too suprisingly first called the "Morkrum" machine. Both World War I and the adoption of teletype by the Associated Press in 1915 brought teletype into worldwide usage over 65 years ago. See Volume 3, Chapter 10 for additional history.

After World War II, literally tens of thousands of teletype machines were made available to radio amateurs for virtually nothing through MARS, the Military Amateur Radio Service. Most of these machines are still in use today. All of these machines utilize the mostly standardized Baudot/Murray code, named after the pioneers who developed it. In the U.S. it is usually referred to as the Baudot code, and in Europe, the Murray code. There are only a few variations between the U.S. and international CCIT No. 2 code, such as "British pound" sign, etc. More about these minor variations later.

In 1980 the Federal Communications Commission awoke from a long nap and authorized the use of the ASCII code on the amateur bands. We will cover ASCII in Chapters 8, 9, & 10.

## THE BAUDOT DATA CODE AND SPEEDS USED BY RADIO AMATEURS

The following summary covers generally accepted practices used by the majority of amateur radio stations using Baudot code radio teletype today. As with virtually all rules there are exceptions, though seldom heard on the amateur radio bands.

The Baudot code consists of a 5 bit word plus a start bit and stop bit. With a 5 bit word there are obviously only 32 different combinations possible. As such, how does Baudot accomodate 26 characters of the alphabet, 10 numbers, and punctuation, Gridley?

NOT VERY EASILY.

Come on, Gridley. Put on your thinking cap.

I LOST IT.

Very well, Gridley. Think about how your manual typewriter works to select upper or lower case characters. You quite simply press the SHIFT key to select a # sign or release the shift key to print the numeral 3. Baudot teletype machines work in much the same way. In this instance we will call lower case, LETTERS and upper case, FIGURES. Baudot uses 11011 binary = 27 decimal to press the shift key and put it into the FIGURES mode and 11111 binary = 31 decimal to put it into the LETTERS mode. The following table illustrates the Baudot code decimal no., binary no., LETTERS and FIGURES:

DECIMAL NUMBER	BINARY	LETTERS	FIGURES
	54321		
0	00000	nothing	nothing
1	00001	E	3
2	00010	line feed	line feed
3	00011	A	- (dash)
4	00100	space	space
5	00101	S	bell
6	00110	I	8
7	00111	, U	7
8	01000	carreturn	carreturn
9	01001	D	\$
10	01010	R	4
11	01011	J	' (apostrophe)
12	01100	N	, (comma)

13	01101	F	!
14	01110	C	:
15	01111	K	(
16	10000	T	5
17	10001	Z	"
18	10010	L	)
19	10011	W	2
20	10100	H	#
21	10101	Y	6
22	10110	P	0
23	10111	Q	1
24	11000	O	9
25	11001	B	?
26	11010	G	&
27	11011	figures	figures
28	11100	M	. (period)
29	11101	X	/
30	11110	V	;
31	11111	letters	letters

The significant differences between the U.S. and CCITT No. 2 standard are in the FIGURES column and are: bell = apostrophe, \$ = WRU (who are you), apostrophe = bell, quote = + sign, and # = British pound sign, respectively. Yet another option is that the # sign is occasionally used to TURN OFF the teletype machines motor when utilized with unattended operation.

## STANDARD BAUDOT TIMING FOR 60, 66, 75, AND 100 SPEEDS

Most electro-mechanical teletype machines' speed may be changed by installing the appropriate gears within the mechanism. Fortunately, all we need do is press SHIFT "S" when in the TRANSMIT MODE and enter the speed desired. Also, in the next Chapter we will include a separate speed change for RECEIVE MODE, if desired, so that you may transmit at one speed while receiving at another. The chart below illustrates start bit lengths, data bit lengths, stop bit lengths, Baud rate, and words per minute for standard speeds.

SPEED	START BIT (ms)	DATA BIT (ms)	STOP BIT (ms)	BAUD RATE	WPM
60	22.00	22.00	31.00	45.45	61.3
66	20.00	20.00	30.00	50.00	66.7
75	17.57	17.57	25.00	56.92	76.7
100	13.47	13.47	19.18	74.20	100.0

Even Gridley will note that the start and data bit lengths are identical, plus the stop bits = approximately 1 1/2 times data bit length. It is important to understand that the stop bit lengths are the MINIMUM amount of time that MUST elapse before another character's start bit may be transmitted. The MAXIMUM amount of time for a stop bit may be ANY length you wish.

## BAUDOT CODE PROTOCOLS - FREQUENCY SHIFT KEYING (FSK)

The start bit is customarily called a SPACE and usually = to an audio frequency of 2295 Hertz. The stop bit is usually a MARK = to an audio frequency of 2125 Hertz. Sometimes one will find a station transmitting the MARKs and SPACEs with reversed audio frequencies which = an INVERTED signal. If one looks at the Baudot code for the letter "D" which = 01001 in binary = 9 decimal it would be transmitted as follows: start bit = 2295 Hz, bit 1 = 1 = 2125 Hz, bit 2 = 0 = 2295 Hz, bit 3 = 0 = 2295 Hz, bit 4 = 1 = 2125 Hz, bit 5 = 0 = 2295 Hz, and the stop bit = 2125 Hz. Remember, the least significant bit is transmitted first, and the most significant bit transmitted last (just prior to the stop bit).

Radio teletype may be transmitted by AM (amplitude modulation) = AFSK on the VHF bands to minimize frequency drift, but on the shortwave bands, 160 through 10 meters, frequency shift keying (FSK) with 170 cycles shift is customary. FSK may be generated by feeding the keyed audio tones directly into the microphone input of a standard ham single sideband transmitter.

Detailed circuits for generating the audio FSK tones for your amateur transmitter are beyond the purview of this book. We suggest you obtain a copy of: "Specialized Communications Techniques" @ \$5 postpaid from the ARRL, 225 Main Street, Newington, Connecticut 06111, to dig deeper.

Our favorite audio frequency shift generator is crystal controlled using a 2.295 MHz crystal and a 2.125 MHz crystal. Both of these crystal oscillators are then divided by 1000 to obtain EXACTLY 2295 and 2125 cycles audio output for space and mark frequencies. The kit of parts and printed circuit board for this "AFSK Generator" is surprisingly inexpensive and is available for approximately \$25 postpaid from: Circuit Board Specialists, PO Box 969, Pueblo, Colorado 81002. Crystals must be ordered separately from JAN or your favorite supplier.

For those without the time to build their own TU (terminal unit) for either transmitting or receiving FSK RTTY (radio teletype) we recommend the new Flesher "TU-170" @ \$249 factory assembled and tested from: Flesher Corporation, PO Box 976, Topeka, Kansas 66601. It is not the cheapest NOR the most expensive RTTY terminal unit on the market, but in our opinion it is the most cost-effective. It has standard TTL logic inputs and outputs and works "fine business" with either the Telesis VAR-80 or Interfacer 2 and the TRS-80 Models I and III. This is the combination, TU-170 and VAR/80, that we will use in this Chapter and Chapters 6 to 10.

The VAR/80 was thoroughly covered in Volume 3's Chapter 5. For receive, the TU-170 is connected to your receiver's speaker output. Its DEMOD output plugs directly into the VAR/80's INPUT #7. For transmit, the VAR/80's OUTPUT #2 is connected to the TU-170's AFSK KEYING terminal and the TU-170's transmitter output pin #2 connected to your SSB transmitter's microphone input. That is all there is to it.

## MODEL III COMPATABILITY - PROGRAM AND EXTERNAL I/O BUS

The following programs in Chapters 5 through 10 are completely compatible with BOTH the Model I and III TRS-80 and have been exhaustively tested with both models. Model III users should read APPENDIX 2's pages 1 through 7 IF they wish to build their own adaptor for the VAR/80 or Interfacer 2, although by the time this Volume is published there should be a number of commercially manufactured Model I accessory to Model III adaptors available. A single TTL chip, some 50 conductor cable, and 2 connectors are all that is required.

We suggest that all timing constants including: TIME 1,2,3,5,6,7 and SPEED2 be increased 15 percent in value to accomodate the Model III's slightly higher clock frequency, even though the programs as they stand will work with most RTTY machines unmodified. Model I users should change the JP 1A19H, return to BASIC, to JP 072H to avoid an occasional error flag IF this function is used.

## SOFTWARE VS. HARDWARE UART - COST AND GRIEF SAVINGS

The programs in Chapters 5 through 10 ALL generate their own parallel to serial, and serial to parallel data conversions. As such, it is unnecessary to purchase the \$99 Radio Shack RS-232C adaptor for either the Model I or Model III TRS-80. For Model I users, this is indeed a blessing as its RS-232C unit is completely useless UNLESS hardwired (soldered) into the circuit. See "80 Microcomputing" May '81, pages 202-203.

## FUNDAMENTAL PROGRAM LOGIC AND FLOW

An initial casual glance at the program may be overwhelming.

I AM BOTH CONFUSED AND TOTALLY LOST!  
YOU GOTTA BE KIDDING!

Gridley, do not let first impressions overwhelm you.

Really, the program is quite simple if we work through the fundamental logic and overlook all the little salient niceties such as timing constants, automatic line feeds, carriage returns, prepared messages, etc. Let's have at it.

Using these ground rules, the program begins at line 3640 where the keyboard awaits your command. Let's assume you wish to transmit the letter "B" at 60 WPM equivalent speed in Baudot, by pressing "B" on the keyboard. The program falls through to line 3900 where "B" is displayed on video, and then JumpPs off to CoNVERT in line 1120. "B" = ASCII 66, so lines 1320 and 1330 send it off to B1 in line 2450 where the D register is assigned the decimal value of 25. Now, decimal 25 = 11001 binary is the Baudot value for the letter B as shown on the chart at the beginning of this Chapter. Line 2460 sends the program off to SEND1 in line 2950 where the Baudot START bit is then transmitted in line 2960. It is followed by the LEAST SIGNIFICANT bit, a 1, which is transmitted in line 2980 and then the D register rotated 1 bit to the right in line 3050. Each bit of 11001 binary = B is transmitted this way till ALL 5 bits have been transmitted and line 3040 sends the program off to FINIS1 in line 3550 that sends the STOP bit and falls through to line 3640, which has us back to the keyboard again awaiting your input. That is the FUNDAMENTAL program logic and flow.

All the rest of the program is simply icing on the cake. Since we will be working stations with electro-mechanical teletype machines with 72 characters per line, the program outputs a line feed and carriage return every 72 characters and allows about 3 characters length time delay for the carriage to mechanically return. Lines 4490 through 6810 are the prepared message segment. Please change them to reflect your own CALL LETTERS and messages desired. INPUT1 in line 7000 is intentionally placed at the END of the program. This is the MEM location where YOU input from the keyboard any prepared message desired is located. It may be as LONG a message as you have memory available. Now, let's take a look at the program before going into the operating aspects.

```

00100 ; - W4UCH BAUDOT TELETYPE TRANSMIT PROGRAM -
00110 ;
00120 ; 60, 66, 75, AND 100 WORDS PER MINUTE EQUIVALENT SPEED
00130 ;
00140 ; COPYRIGHT 1981 (C) OBJECT = BAUDOT1 & SOURCE = BAUDOT2
00150 ;
00160 W4UCH EQU 28000 ;=6D60H FOR YOU PURISTS
00170 ORG W4UCH ;LET'S START HERE
00180 EX AF,AF' ;SWAP ALTERNATE REGISTERS
00190 EXX ;SWAP ALTERNATE REGISTERS
00200 PUSH IX ;SAVE IN STACK
00210 PUSH IY ;SAVE IN STACK
00220 DI ;DISABLE INTERRUPTS
00230 CALL CLS ;COMPATABILITY MOD 1 & 3

```

00240	GO	JP	G02	;GOTO G02	00850	SEVEN5	LD	HL,1209	;1209 = 75 SPEED
00250	G01	CALL	CARRET	;VIDEO CARRIAGE RETURN	00860		LD	(SPEED2),HL	;STASH IT AWAY
00260		LD	A,0	;ZERO OUT CHARACTERS -	00870		LD	HL,1814	;STOP BIT TIME DELAY
00270		LD	(SIGN3),A	;PER LINE COUNTER	00880		LD	(TIME5),HL	;STASH IT AWAY
00280		LD	HL,MESS	;SPEED MESSAGE	00890		LD	HL,1222	;RECEIVE BIT LENGTH
00290		CALL	28A7H	;DISPLAY MESSAGE ROUTINE	00900		LD	(TIME1),HL	;STASH IT AWAY
00300		CALL	1B83H	;KYBD VIDEO INPUT ROUTINE	00910		LD	HL,611	;1/2 RECEIVE BIT LENGTH
00310		RST	10H	;SCAN \$ SET 'C' FLAG	00920		LD	(TIME2),HL	;STASH IT AWAY
00320		CALL	0E6CH	;ASCII \$ TO ACCUM RET MIN	00930		LD	HL,1322	;RECEIVE BIT LENGTH +100
00330		CALL	0A7FH	;CONVERT ACCUM TO INTEGER	00940		LD	(TIME3),HL	;STASH IT AWAY
00340		LD	(SPEED1),HL	;STASH IT AWAY IN SPEED1	00950		RET		;RETURN WHENCE U CAME +1
00350		CALL	SPD	;CALCULATE EQUIV SPEEDS	00960	ONE100	LD	HL,927	;927 = 100 SPEED
00360	G02	CALL	CARRET	;VIDEO CARRIAGE RETURN	00970		LD	(SPEED2),HL	;STASH IT AWAY
00370		LD	HL,MESS1	; 'TRANSMIT MODE'	00980		LD	HL,1390	;STOP BIT TIME DELAY
00380		CALL	28A7H	;DISPLAY MESSAGE ROUTINE	00990		LD	(TIME5),HL	;STASH IT AWAY
00390		CALL	SPD1	;EQUIV. WORDS PER MINUTE	01000		LD	HL,936	;RECEIVE BIT LENGTH
00400		CALL	CARRET	;CARRIAGE RETURN	01010		LD	(TIME1),HL	;STASH IT AWAY
00410		CALL	AUTO1	;LNFEEED & CARRIAGE RETN	01020		LD	HL,468	;1/2 RECEIVE BIT LENGTH
00420		LD	A,0EH	;TURN ON CURSOR	01030		LD	(TIME2),HL	;STASH IT AWAY
00430		CALL	033H	;DO IT ON VIDEO	01040		LD	HL,1036	;RECEIVE BIT LENGTH +100
00440		JP	KYBD2	;GOTO KYBD FOR INSTRUCT.	01050		LD	(TIME3),HL	;STASH IT AWAY
00450	SPEED1	DEFW	60	;60, 66, 75, OR 100 WPM	01060		RET		;RETURN WHENCE U CAME +1
00460	SPEED2	DEFW	1515	;EQUIV. DATA BIT LENGTH	01070	SPD1	LD	HL,(SPEED1)	;EQUIV. WORDS PER MINUTE
00470	MESS	DEFM	'INPUT SPEED 60, 66, 75, 100'		01080		CALL	0A9AH	;MOVE HL TO ACCUM
00480		DEFB	0	;MESSAGE DELIMITER	01090		CALL	0FBDH	;CONV. ACCUM TO STRING
00490	MESS1	DEFM	'TRANSMIT MODE - WPM ='		01100		CALL	28A7H	;DISPLAY STRING ROUTINE
00500		DEFB	0	;MESSAGE DELIMITER	01110		RET		;RETURN WHENCE U CAME +1
00510	SPD	LD	HL,(SPEED1)	;SPEED INTEGER TO HL	01120	CNVERT	PUSH	AF	;SAVE AF IN STACK
00520		LD	A,L	;LOW BYTE TO 'A'	01130		LD	A,(SIGN3)	;CHARS. PER LINE COUNTER
00530		CP	60	;60 SPEED ?	01140		INC	A	;+1 TO 'A'
00540		JP	Z,SIXTY	;IF SO, GOTO SIXTY	01150		LD	(SIGN3),A	;STASH IT AWAY IN MEM
00550		CP	66	;66 SPEED ?	01160		CP	72	;SUBTRACT 72 & SET 'Z'
00560		JP	Z,SIXT6	;IF SO, GOTO SIXTY SIX	01170		CALL	Z,AUTO1	;AUTO LNFEEED & CARRETN
00570		CP	75	;75 SPEED ?	01180		POP	AF	;RESTORE 'A' FROM STACK
00580		JP	Z,SEVEN5	;IF SO, GOTO SEVENTY FIVE	01190		CP	32	;IS IT A SPACE ?
00590		CP	100	;100 SPEED	01200		JP	Z,SPACE1	;IF SO, GOTO SPACE1
00600		JP	Z,ONE100	;IF SO, GOTO ONE HUNDRED	01210		PUSH	AF	;SAVE 'A' IN THE STACK
00610		POP	HL	;ADJUST STACK	01220		LD	A,(SIGN1)	;LTRS/FIGS SIGNPOST
00620		JP	G01	;IF ERROR, START OVER	01230		CP	0	;0 = LTRS & 1 = FIGS
00630	SIXTY	LD	HL,1514	;1514 = 60 SPEED	01240		JP	NZ,FIGS2	;IF NOT, GOTO FIGS 2
00640		LD	(SPEED2),HL	;STASH IT AWAY	01250		POP	AF	;RESTORE 'A' FROM STACK
00650		LD	HL,2271	;STOP BIT TIME DELAY	01260		CP	65	; -65 FM 'A' SET SIGN FLAG
00660		LD	(TIME5),HL	;STASH IT AWAY	01270		PUSH	AF	;STASH AF IN THE STACK
00670		LD	HL,1530	;RECEIVE BIT LENGTH	01280		JP	M,FIGS1	;GOTO FIGS IF < ASCII 65
00680		LD	(TIME1),HL	;STASH IT AWAY	01290		POP	AF	;RESTORE AF FROM STACK
00690		LD	HL,765	;1/2 RECEIVE BIT LENGTH	01300		CP	65	
00700		LD	(TIME2),HL	;STASH IT AWAY	01310		JP	Z,A1	;IF SO, GOTO 'A'
00710		LD	HL,1630	;RECEIVE BIT LENGTH +100	01320		CP	66	
00720		LD	(TIME3),HL	;STASH IT AWAY	01330		JP	Z,B1	;IF SO, GOTO 'B'
00730		RET		;RETURN WHENCE U CAME +1	01340		CP	67	
00740	SIXT6	LD	HL,1377	;1377 = 66 SPEED	01350		JP	Z,C1	;IF SO GOTO 'C'
00750		LD	(SPEED2),HL	;STASH IT AWAY	01360		CP	68	
00760		LD	HL,2066	;STOP BIT TIME DELAY	01370		JP	Z,D1	;IF SO, GOTO 'D'
00770		LD	(TIME5),HL	;STASH IT AWAY	01380		CP	69	
00780		LD	HL,1390	;RECEIVE BIT LENGTH	01390		JP	Z,E1	;IF SO, GOTO 'E'
00790		LD	(TIME1),HL	;STASH IT AWAY	01400		CP	70	
00800		LD	HL,695	;1/2 RECEIVE BIT LENGTH	01410		JP	Z,F1	;IF SO, GOTO 'F'
00810		LD	(TIME2),HL	;STASH IT AWAY	01420		CP	71	
00820		LD	HL,795	;RECEIVE BIT LENGTH +100	01430		JP	Z,G1	;IF SO, GOTO 'G'
00830		LD	(TIME3),HL	;STASH IT AWAY	01440		CP	72	
00840		RET		;RETURN WHENCE U CAME +1	01450		JP	Z,H1	;IF SO, GOTO 'H'

01460	CP	73		02070	CP	45	; - AND 'A'
01470	JP	Z,I1	;IF SO, GOTO 'I'	02080	JP	Z,A1	;IF SO, GOTO A1
01480	CP	74		02090	CP	46	; . AND 'M'
01490	JP	Z,J1	;IF SO, GOTO 'J'	02100	JP	Z,M1	;IF SO, GOTO M1
01500	CP	75		02110	CP	47	; / AND 'X'
01510	JP	Z,K1	;IF SO, GOTO 'K'	02120	JP	Z,X1	;IF SO, GOTO X1
01520	CP	76		02130	CP	48	; ZERO AND 'P'
01530	JP	Z,L1	;IF SO, GOTO 'L'	02140	JP	Z,P1	;IF SO, GOTO P1
01540	CP	77		02150	CP	49	; 1 AND 'Q'
01550	JP	Z,M1	;IF SO, GOTO 'M'	02160	JP	Z,Q1	;IF SO, GOTO Q1
01560	CP	78		02170	CP	50	; 2 AND 'W'
01570	JP	Z,N1	;IF SO, GOTO 'N'	02180	JP	Z,W1	;IF SO, GOTO W1
01580	CP	79		02190	CP	51	; 3 AND 'E'
01590	JP	Z,O1	;IF SO, GOTO 'O'	02200	JP	Z,E1	;IF SO, GOTO E1
01600	CP	80		02210	CP	52	; 4 AND 'R'
01610	JP	Z,P1	;IF SO, GOTO 'P'	02220	JP	Z,R1	;IF SO, GOTO R1
01620	CP	81		02230	CP	53	; 5 AND 'T'
01630	JP	Z,Q1	;IF SO, GOTO 'Q'	02240	JP	Z,T1	;IF SO, GOTO T1
01640	CP	82		02250	CP	54	; 6 AND 'Y'
01650	JP	Z,R1	;IF SO, GOTO 'R'	02260	JP	Z,Y1	;IF SO, GOTO Y1
01660	CP	83		02270	CP	55	; 7 AND 'U'
01670	JP	Z,S1	;IF SO, GOTO 'S'	02280	JP	Z,U1	;IF SO, GOTO U1
01680	CP	84		02290	CP	56	; 8 AND 'I'
01690	JP	Z,T1	;IF SO, GOTO 'T'	02300	JP	Z,I1	;IF SO, GOTO I1
01700	CP	85		02310	CP	57	; 9 AND 'O' (OH)
01710	JP	Z,U1	;IF SO, GOTO 'U'	02320	JP	Z,O1	;IF SO, GOTO O1
01720	CP	86		02330	CP	58	; : AND 'C'
01730	JP	Z,V1	;IF SO, GOTO 'V'	02340	JP	Z,C1	;IF SO, GOTO C1
01740	CP	87		02350	CP	59	; ; AND 'V'
01750	JP	Z,W1	;IF SO, GOTO 'W'	02360	JP	Z,V1	;IF SO, GOTO V1
01760	CP	88		02370	CP	63	; ? AND 'B'
01770	JP	Z,X1	;IF SO, GOTO 'X'	02380	JP	Z,B1	;IF SO, GOTO B1
01780	CP	89		02390	JP	SPACE1	
01790	JP	Z,Y1	;IF SO, GOTO 'Y'	02400			
01800	CP	90		02410	; COMMENTS ILLUSTRATE BAUDOT BINARY NUMBER & EQUIVALENTS		
01810	JP	Z,Z1	;IF SO, GOTO 'Z'	02420			
01820	JP	SPACE1		02430	A1	LD	D,3 ; 00011 = A AND -
01830	FIGS1	LD	A,1 ; 0 = LTRS & 1 = FIGS	02440	JP	SEND1	; SEND IT
01840		LD	(SIGN1),A ; SET SIGNPOST TO FIGS	02450	B1	LD	D,25 ; 11001 = B AND ?
01850	FIGS2	POP	AF ; RESTORE 'A' FROM STACK	02460	JP	SEND1	; SEND IT
01860				02470	C1	LD	D,14 ; 01110 = C AND :
01870	; COMMENTS ILLUSTRATE EQUAL FIGS AND LTRS IN BAUDOT CODE			02480	JP	SEND1	; SEND IT
01880				02490	D1	LD	D,9 ; 01001 = D AND \$
01890	CP	33	; ! AND 'F'	02500	JP	SEND1	; SEND IT
01900	JP	Z,F1	;IF SO, GOTO F1	02510	E1	LD	D,1 ; 00001 = E AND 3
01910	CP	34	; " AND 'Z' IN BAUDOT	02520	JP	SEND1	; SEND IT
01920	JP	Z,Z1	;IF SO, GOTO Z1	02530	F1	LD	D,13 ; J:101 = F AND !
01930	CP	35	; # AND 'H'	02540	JP	SEND1	; SEND IT
01940	JP	Z,H1	;IF SO, GOTO H1	02550	G1	LD	D,26 ; 11010 = G AND &
01950	CP	36	; \$ AND 'D'	02560	JP	SEND1	; SEND IT
01960	JP	Z,D1	;IF SO GOTO D1	02570	H1	LD	D,20 ; 10100 = H AND #
01970	CP	38	; & AND 'G'	02580	JP	SEND1	; SEND IT
01980	JP	Z,G1	;IF SO, GOTO G1	02590	I1	LD	D,6 ; 00110 = I AND 8
01990	CP	39	; ' AND 'J'	02600	JP	SEND1	; SEND IT
02000	JP	Z,J1	;IF SO, GOTO J1	02610	J1	LD	D,11 ; 01011 = J AND '
02010	CP	40	; ( AND 'K'	02620	JP	SEND1	; SEND IT
02020	JP	Z,K1	;IF SO, GOTO K1	02630	K1	LD	D,15 ; 01111 = K AND (
02030	CP	41	; ) AND 'L'	02640	JP	SEND1	; SEND IT
02040	JP	Z,L1	;IF SO, GOTO L1	02650	L1	LD	D,18 ; 10010 = L AND )
02050	CP	44	; , AND 'N'	02660	JP	SEND1	; SEND IT
02060	JP	Z,N1	;IF SO, GOTO N1	02670	M1	LD	D,28 ; 11100 = M AND .

02680	JP	SEND1	;SEND IT	03290	SPACE1	LD	A,(SIGN1)	;0 = LTRS & 1 = FIGS
02690 N1	LD	D,12	; 01100 = N AND ,	03300	CP		0	;SUBTRACT ZERO SET 'Z'
02700	JP	SEND1	;SEND IT	03310	JP		NZ,SPACE2	;IF IN FIGS GOTO SPACE 2
02710 O1	LD	D,24	; 11000 = 0 AND 9	03320	LD		D,4	; 00100 = SPACE
02720	JP	SEND1	;SEND IT	03330	JP		SEND1	;SEND IT
02730 P1	LD	D,22	; 10110 = P AND ZERO	03340	SPACE2	LD	A,2	;2 = UNSHIFT ON SPACE
02740	JP	SEND1	;SEND IT	03350	LD		(MORE),A	;STASH IT IN MORE
02750 Q1	LD	D,23	; 10111 = Q AND 1	03360	LD		A,0	;0 = LTRS (FOR UNSHIFT)
02760	JP	SEND1	;SEND IT	03370	LD		(SIGN1),A	;STASH IT IN SIGNPOST
02770 R1	LD	D,10	; 01010 = R AND 4	03380	LD		D,4	; 00100 = SPACE
02780	JP	SEND1	;SEND IT	03390	JP		SEND1	;SEND IT
02790 S1	LD	D,5	; 00101 = S AND BELL	03400	LTRS2	LD	A,0	;0 = NOTHING MORE
02800	JP	SEND1	;SEND IT	03410	LD		(MORE),A	;STASH IT AWAY IN MORE
02810 T1	LD	D,16	; 10000 = T AND 5	03420	LD		D,31	; 11111 = LTRS
02820	JP	SEND1	;SEND IT	03430	JP		SEND1	;SEND IT
02830 U1	LD	D,7	; 00111 = U AND 7	03440	SIGN1	DEFB	0	;0 = LTRS & 1 = FIGS
02840	JP	SEND1	;SEND IT	03450	SIGN2	DEFB	0	;PREPARE MES. SIGNPOST
02850 V1	LD	D,30	; 11110 = V AND ;	03460	SIGN3	DEFB	0	;CHARS. PER LINE COUNTER
02860	JP	SEND1	;SEND IT	03470	MORE	DEFB	0	;AUTO EXTRA CHARACTERS
02870 W1	LD	D,19	; 10011 = W AND 2	03480	TIME5	DEFW	2271	;STOP BIT TIME STASH
02880	JP	SEND1	;SEND IT	03490	TIME6	LD	A,0	;0=2215 KHZ & 1=2295 KHZ
02890 X1	LD	D,29	; 11101 = X AND /	03500	OUT		(0),A	;SEND 2215 KHZ STOP SIG
02900	JP	SEND1	;SEND IT	03510	LD		BC,(TIME5)	;STOP BIT TIME DELAY
02910 Y1	LD	D,21	; 10101 = Y AND 6	03520	CALL		060H	;ROM DELAY SUBROUTINE
02920	JP	SEND1	;SEND IT	03530	RET			;RETURN WHENCE U CAME +1
02930 Z1	LD	D,17	; 10001 = Z AND "	03540	TIME7	DEFW	34425	;CARRIAGE RETURN DELAY
02940	JP	SEND1	;SEND IT	03550	FINIS1	CALL	TIME6	;STOP BIT TIME DELAY
02950 SEND1	LD	L,0	;ZERO OUT 'L' COUNTER	03560	LD		A,(MORE)	;ANY 'MORE' TO SEND ?
02960	CALL	SPACE	;SEND START BIT	03570	CP		1	;SUBTRACT 1
02970 SEND2	BIT	0,D	;TEST BIT ZERO OF 'L'	03580	JP		Z,CARETN	;IF SO, RETURN CARRIAGE
02980	CALL	NZ,MARK	;IF SO, SEND MARK TONE	03590	CP		2	;SUBTRACT 2
02990	BIT	0,D	;TEST BIT ZERO OF 'L'	03600	JP		Z,LTRS2	;IF SO, GOTO LTRS2
03000	CALL	Z,SPACE	;ELSE SEND SPACE TONE	03610	KYBD2	LD	A,(SIGN2)	;PREPARED MESSAGE ?
03010	INC	L	;+1 TO BIT COUNTER	03620	CP		1	;1 = MESSAGE BEING SENT
03020	LD	A,5	;5 BITS PER CHARACTER	03630	JP		Z,SEND4	;IF SO, GOTO SEND4
03030	CP	L	;SUBTRACT 'L' FROM 'A'	03640	CALL		049H	;AWAIT KEYBOARD INPUT
03040	JP	Z,FINIS1	;GOTO FINIS 'IF DONE'	03650	CP		31	;CLEAR KEY PRESSED ?
03050	RRC	D	;ROTATE D RIGHT CIRCULAR	03660	JP		Z,G02	;LATER-WE'LL GOTO RECEIVE
03060	JP	SEND2	;GOTO SEND NEXT BIT	03670	XMIT3	CP	32	;ASCII SPACE ?
03070 SPACE	LD	A,4	;0=2125 KHZ & 4=2295 KHZ	03680	JP		Z,VIDEO2	;JUMP OVER COMPARES
03080	OUT	(0),A	;TURN ON 2295 KHZ SPACE	03690	CP		98	;SHIFT 'B' PRESSED ?
03090	LD	BC,(SPEED2)	;BAUD RATE EQUIVALENT	03700	JP		Z,BASIC	;IF SO, GOTO BASIC
03100	CALL	060H	;ROM DELAY SUBROUTINE	03710	CP		8	;8 = ASCII BACKSPACE
03110	RET		;RETURN WHENCE U CAME +1	03720	JP		Z,KYBD2	;BAUDOT = NO SUCH THING
03120 MARK	LD	A,0	;0=2125 KHZ & 4=2295 KHZ	03730	CP		13	;CARRIAGE RETURN ?
03130	OUT	(0),A	;TURN ON 2125 KHZ MARK	03740	JP		Z,LNFEED	;AUTO LINE FEED & C.R.
03140	LD	BC,(SPEED2)	;BAUD RATE EQUIVALENT	03750	CP		27	;SHIFT UP ARROW PRESSED ?
03150	CALL	060H	;ROM DELAY SUBROUTINE	03760	JP		Z,MENU	;IF SO GOTO MESSAGE TABLE
03160	RET		;RETURN WHENCE U CAME +1	03770	CP		91	;UP ARROW PRESSED ?
03170 LNFEED	LD	A,93	;= ASCII LEFT ARROW	03780	JP		Z,SEND5	;PREPAR. MESSAGE NO TABLE
03180	CALL	033H	;DISPLAY IT ON VIDEO	03790	CP		115	;SHIFT 'S' PRESSED ?
03190	CALL	SKIP	;VIDEO CARRIAGE RETURN	03800	JP		Z,G01	;GOTO SPEED CHANGE
03200	LD	A,1	;1 = AUTO CARRIAGE RETN	03810	CP		65	; -65 SET SIGN FLAG
03210	LD	(MORE),A	;STASH IT AWAY IN 'MORE'	03820	JP		M,TEST1	;IF MINUS TEST LTRS/FIGS
03220	LD	D,2	; 00010 = LINE FEED	03830	CP		91	; -91 SET SIGN FLAG
03230	JP	SEND1	;SEND IT	03840	JP		P,KYBD2	;INVALID-RETURN TO KYBD
03240 CARETN	LD	A,0	;0 = NO MORE	03850	PUSH		AF	;SAVE AF IN STACK
03250	LD	(MORE),A	;NOTHING 'MORE' TO SEND	03860	LD		A,(SIGN1)	;0 = LTRS & 1 = FIGS
03260	LD	(SIGN3),A	;ZERO OUT CHAR. COUNTER	03870	CP		1	; -1 FROM 'A' SET 'Z' FLAG
03270	LD	D,8	; 01000 = CARRIAGE RETURN	03880	JP		Z,RESET1	;IF FIGS, GO AND RESET
03280	JP	SEND1	;SEND IT	03890	POP		AF	;RESTORE AF FROM STACK

03900	VIDEO2	CALL	033H	;DISPLAY 'A' ON VIDEO	04510	LD	HL,MENU1	;ADDRESS TO HL
03910		JP	CONVERT	;GOTO CONVERT TO BAUDOT	04520	CALL	28A7H	;ROM DISPLAY ROUTINE
03920	TEST1	PUSH	AF	;SAVE AF IN STACK	04530	CALL	SKIP	;C.R.
03930		LD	A,(SIGN1)	;LTRS/FIGS SIGNPOST	04540	CALL	SKIP	;C.R.
03940		CP	1	;IS IT FIGS ?	04550	LD	HL,MS1	;MESSAGE 1 ADDRESS
03950		JP	NZ,SET	;IF NOT, SEND FIGS	04560	CALL	28A7H	;DISPLAY MESSAGE
03960		POP	AF	;RESTORE AF FROM STACK	04570	CALL	SKIP	;C.R.
03970		JP	VIDEO2	;GOTO VIDEO AND IT	04580	LD	HL,MS2	;MESSAGE 2 ADDRESS
03980	SET	LD	A,1	;0 = LTRS & 1 = FIGS	04590	CALL	28A7H	;DISPLAY MESSAGE
03990		LD	(SIGN1),A	;LTRS/FIGS SIGNPOST	04600	CALL	SKIP	;C.R.
04000		CALL	SPACE	;START BIT	04610	LD	HL,MS3	;MESSAGE 3 ADDRESS
04010		CALL	MARK	;FIGS = 11011	04620	CALL	28A7H	;DISPLAY MESSAGE
04020		CALL	MARK	;=1	04630	CALL	SKIP	;C.R.
04030		CALL	SPACE	;=0	04640	LD	HL,MS4	;MESSAGE 4 ADDRESS
04040		CALL	MARK	;=1	04650	CALL	28A7H	;DISPLAY MESSAGE
04050		CALL	MARK	;=1	04660	CALL	SKIP	;C.R.
04060		CALL	TIME6	;STOP BIT	04670	LD	HL,MS5	;MESSAGE 5 ADDRESS
04070		POP	AF	;RESTORE AF FROM STACK	04680	CALL	28A7H	;DISPLAY MESSAGE
04080		JP	VIDEO2	;GO SEND CHARACTER	04690	CALL	SKIP	;C.R.
04090	RESET1	LD	A,0	;0 = LTRS & 1 = FIGS	04700	LD	HL,MS6	;MESSAGE 6 ADDRESS
04100		LD	(SIGN1),A	;LTRS/FIGS SIGNPOST	04710	CALL	28A7H	;DISPLAY MESSAGE
04110		CALL	SPACE	;START BIT	04720	CALL	SKIP	;C.R.
04120		CALL	MARK	;LETTERS = 11111	04730	LD	HL,MS7	;MESSAGE 7 ADDRESS
04130		CALL	MARK	;=1	04740	CALL	28A7H	;DISPLAY MESSAGE
04140		CALL	MARK	;=1	04750	CALL	SKIP	;C.R.
04150		CALL	MARK	;=1	04760	LD	HL,MS8	;MESSAGE 8 ADDRESS
04160		CALL	MARK	;=1	04770	CALL	28A7H	;DISPLAY MESSAGE
04170		CALL	TIME6	;STOP BIT	04780	CALL	SKIP	;C.R.
04180		POP	AF	;RESTORE AF FROM STACK	04790	LD	HL,MS9	;MESSAGE 9 ADDRESS
04190		JP	VIDEO2	;GOTO VIDEO AND SEND IT	04800	CALL	28A7H	;DISPLAY MESSAGE
04200	SKIP	LD	A,13	;CARRIAGE RETURN ON VIDEO	04810	CALL	SKIP	;C.R.
04210		CALL	033H	;DO IT	04820	LD	HL,MS10	;MESSAGE 10 ADDRESS
04220		RET		;RETURN WHEN U CAME +1	04830	CALL	28A7H	;DISPLAY MESSAGE
04230	SEND5	LD	A,1	;1 = PREPARED MESSAGE	04840	CALL	SKIP	;C.R.
04240		LD	(SIGN2),A	;STASH IT IN SIGNPOST 2	04850	LD	HL,MS10A	;MESSAGE 10A ADDRESS
04250		CALL	049H	;AWAIT 'A' TO 'W' INPUT	04860	CALL	28A7H	;DISPLAY MESSAGE
04260		JP	SEND6	;GO AN SEND IT	04870	CALL	SKIP	;C.R.
04270	AUTO1	LD	A,0	;ZERO OUT 'A'	04880	CALL	SKIP	;C.R.
04280		LD	(SIGN3),A	;ZERO TO CHARS/LINE CTR	04890	LD	HL,MS11	;MESSAGE 11 ADDRESS
04290		CALL	SPACE	;START BIT	04900	CALL	28A7H	;DISPLAY MESSAGE
04300		CALL	SPACE	;00010 = LINE FEED	04910	CALL	049H	;AWAIT KEYBOARD INPUT
04310		CALL	MARK	;=1	04920	PUSH	AF	;SAVE AF IN STACK
04320		CALL	SPACE	;=0	04930	CALL	CLS	;COMPATABILITY MOD 1 & 3
04330		CALL	SPACE	;=0	04940	POP	AF	;RESTORE AF FROM STACK
04340		CALL	SPACE	;=0	04950	SEND6	CP	65
04350		CALL	TIME6	;STOP BIT	04960	JP	Z,CQ	;IF SO, GOTO CQ
04360		CALL	TIME6	;EXTRA LINE FEED DELAY	04970	CP	66	;B ?
04370		CALL	SPACE	;START BIT FOR CARRETURN	04980	JP	Z,QTH	;IF SO, GOTO QTH
04380		CALL	SPACE	;01000 = CARRIAGE RETURN	04990	CP	67	;C ?
04390		CALL	SPACE	;=0	05000	JP	Z,CQDX	;IF SO, GOTO CQ DX
04400		CALL	SPACE	;=0	05010	CP	68	;D ?
04410		CALL	MARK	;=1	05020	JP	Z,CQSS	;IF SO, GOTO CQ SS
04420		CALL	SPACE	;=0	05030	CP	69	;E ?
04430		CALL	TIME6	;STOP BIT	05040	JP	Z,QRZ	;IF SO, GOTO QRZ
04440		LD	A,93	;ASCII 93 = LEFT ARROW	05050	CP	70	;F ?
04450		CALL	033H	;DISPLAY IT ON VIDEO	05060	JP	Z,SEVEN3	;IF SO, GOTO 73
04460		LD	BC,(TIME7)	;CARRIAGE RETURN DELAY -	05070	CP	71	;G ?
04470		CALL	060H	;FOR MECHANICAL PRINTERS	05080	JP	Z,RST59	;IF SO, GOTO RST 5 X 9
04480		RET		;RETURN WHEN U CAME +1	05090	CP	72	;H ?
04490	MENU	CALL	CLS	;COMPATABILITY MOD 1 & 3	05100	JP	Z,RST55	;IF SO, GOTO RST 5 X 5
04500		CALL	SKIP	;VIDEO CARRIAGE RETURN	05110	CP	73	;I ?

05120	JP	Z,QRX	;IF SO, GOTO QRX	30	DEFB	0	;MESSAGE DELIMITER
05130	CP	74	;J ?	05640	CALL	SKIP	;C.R.
05140	JP	Z,QRM	;IF SO, GOTO QRM	05650	MS10A	DEFM	HANDLE = U
05150	CP	75	;K ?				INPUT MESSAGE = V & W'
05160	JP	Z,QRN	;IF SO, GOTO QRN	05660	DEFB	0	;MESSAGE DELIMITER
05170	CP	76	;L ?	05670	CALL	SKIP	;C.R.
05180	JP	Z,QSY	;IF SO, GOTO QSY	05680	MS11	DEFM	ENTER PREPARED
05190	CP	77	;M ?				MESSAGE DESIRED ?
05200	JP	Z,QSYUP	;IF SO, GOTO QSY UP	05690	DEFB	0	;MESSAGE DELIMITER
05210	CP	78	;N ?	05700	CQ	LD	IQ,CQ1
05220	JP	Z,QSYDN	;IF SO, GOTO QSY DOWN	05710	JP	SEND3	;GOTO SEND 3
05230	CP	79	;O ?	05720	QTH	LD	IY,QTH1
05240	JP	Z,SECT	;IF SO, GOTO SECTION	05730	JP	SEND3	;GOTO SEND 3
05250	CP	80	;P ?	05740	CQDX	LD	IY,CQDX1
05260	JP	Z,TRS80	;IF SO, GOTO TRS-80	05750	JP	SEND3	;GOTO SEND3
05270	CP	81	;Q ?	05760	CQSS	LD	IY,CQSS1
05280	JP	Z,PGMHR	;IF SO, GOTO PROGRAM HR	05770	JP	SEND3	;GOTO SEND 3
05290	CP	82	;R ?	05780	QRZ	LD	IY,QRZ1
05300	JP	Z,RIGHR	;IF SO, GOTO RIG HERE	05790	JP	SEND3	;GOTO SEND 3
05310	CP	83	;S ?	05800	SEVEN3	LD	IY,QRZ
05320	JP	Z,RYRY	;IF SO, GOTO RYRYRY	05810	JP	SEND3	;GOTO SEND 3
05330	CP	84	;T ?	05820	RST59	LD	IY,RST591
05340	JP	Z,QUICK	;IF SO, GOTO QUICK BROWN	05830	JP	SEND3	;GOTO SEND 3
05350	CP	85	;U ?	05840	RST55	LD	IY,RST551
05360	JP	Z,HANDL	;IF SO, GOTO HANDLE	05850	JP	SEND3	;GOTO SEND 3
05370	CP	86	;V ?	05860	QRX	LD	IY,QRX1
05380	JP	Z,INPUT2	;IF SO, GOTO INPUT MESG.	05870	JP	SEND3	;GOTO SEND 3
05390	CP	87	;W ?	05880	QRM	LD	IY,QRM1
05400	JP	Z,INPUT	;IF SO, SEND INPUT MESG.	05890	JP	SEND3	;GOTO SEND 3
05410	JP	MENU	;INPUT ERROR TRAP	05900	QRN	LD	IY,QRN1
05420	MENU1	DEFM	PREPARED MESSAGE SUBROUTINE'	05910	JP	SEND3	;GOTO SEND 3
05430	DEFB	0	;MESSAGE DELIMITER	05920	QSY	LD	IY,QSY1
05440	MS1	DEFM	CQ = A	05930	JP	SEND3	;GOTO SEND 3
			QTH = B'	05940	QSYUP	LD	IY,QSYUP1
05450	DEFB	0	;MESSAGE DELIMITER	05950	JP	SEND3	;GOTO SEND 3
05460	MS2	DEFM	CQ DX = C	05960	QSYDN	LD	IY,QSYDN1
			CQ SS = D'	05970	JP	SEND3	;GOTO SEND 3
05470	DEFB	0	;MESSAGE DELIMITER	05980	SECT	LD	IY,SECT1
05480	MS3	DEFM	QRZ = E	05990	JP	SEND3	;GOTO SEND 3
			73 = F'	06000	TRS80	LD	IY,TRS801
05490	DEFB	0	;MESSAGE DELIMITER	06010	JP	SEND3	;GOTO SEND 3
05500	MS4	DEFM	RST 5X9 PLUS = G	06020	PGMHR	LD	IY,PGMHR1
			RST 5X5 = H'	06030	JP	SEND3	;GOTO SEND 3
05510	DEFB	0	;MESSAGE DELIMITER	06040	RIGHR	LD	IY,RIGHR1
05520	MS5	DEFM	QRX = I	06050	JP	SEND3	;GOTO SEND 3
			QRM = J'	06060	RYRY	LD	IY,RYRY1
05530	DEFB	0	;MESSAGE DELIMITER	06070	JP	SEND3	;GOTO SEND 3
05540	MS6	DEFM	QRN = K	06080	QUICK	LD	IY,QUICK1
			QSY = L'	06090	JP	SEND3	;GOTO SEND3
05550	DEFB	0	;MESSAGE DELIMITER	06100	HANDL	LD	IY,HANDL1
05560	MS7	DEFM	QSY UP = M	06110	JP	SEND3	;GOTO SEND 3
			QSY DOWN = N'	06120	INPUT	LD	IY,INPUT1
05570	DEFB	0	;MESSAGE DELIMITER	06130	JP	SEND3	;GOTO SEND 3
05580	MS8	DEFM	SECTION = 0	06140	SEND3	LD	A,1
			TRS-80 = P'	06150	LD		(SIGN2),A
05590	DEFB	0	;MESSAGE DELIMITER	06160	SEND4	LD	A,(IY)
05600	MS9	DEFM	PROGRAM HERE = Q	06170	CP	0	;0 = END OF MESSAGE
			RIG HERE = R'	06180	JP	Z,KYBD3	;IF SO, GOTO KYBD 3
05610	DEFB	0	;MESSAGE DELIMITER	06190	INC	IY	;+1 TO MESSAGE ADDRESS
05620	MS10	DEFM	RYRYRY = S	06200	JP	XMIT3	;GO SEND IT
			UICK BROWN = T'	06210	KYBD3	LD	A,0
							;0 = MESSAGE DONE

06670	INPUT3	CALL	049H	;AWAIT KEYBOARD INPUT
06680		CP	8	;8 = ASCII BACKSPACE
06690		JP	Z,BACK	;GOTO BACKSPACE
06700		CP	13	;13 = 'ENTER'
06710		JP	Z,DONE	;GOTO DONE IF FINISHED
06720		LD	(HL),A	;STASH IT IN MEM
06730		CALL	033H	;DISPLAY IT ON VIDEO
06740		INC	HL	;+1 TO HL REGISTER
06750		JP	INPUT3	;GO BACK FOR ANOTHER INP
06760	BACK	DEC	HL	; -1 TO HL REGISTER
06770		CALL	033H	;DISPLAY IT ON VIDEO
06780		JP	INPUT3	;GO BACK FOR ANOTHER INP
06790	DONE	LD	A,0	;ZERO IS THE DELIMITER
06800		LD	(HL),A	;STASH IT IN MEM AT HL
06810		JP	KYBD2	;GOTO KYBD FOR INSTRUCTS.
06820	BASIC	CALL	CLS	;COMPATABILITY MOD 1 & 3
06830		EX	AF,AF'	;SWAP ALTERNATE REGISTERS
06840		EXX		;SWAP ALTERNATE REGISTERS
06850		POP	IY	;RESTORE FROM STACK
06860		POP	IX	;RESTORE FROM STACK
06870		JP	1A19H	;RETURN TO BASIC 'READY'
06880	TIME1	DEFW	1530	;SAVE 2 BYTES FOR TIME 1
06890	TIME2	DEFW	765	;SAVE 2 BYTES FOR TIME 2
06900	TIME3	DEFW	865	;SAVE 2 BYTES FOR TIME 3
06910	CARRET	LD	A,0DH	;0DH = CARRIAGE RETURN
06920		CALL	033H	;DO IT ON VIDEO
06930		RET		;RETURN WHENCE U CAME + 1
06940	CLS	CALL	01C9H	;STANDARD ROM CLS ROUTINE
06950		LD	A,0	;MODEL 3 COMPATABILITY
06960		OUT	(224),A	; " " "
06970		LD	A,48	; " " "
06980		OUT	(236),A	; " " "
06990		RET		;RETURN WHENCE U CAME + 1
07000	INPUT1	DEFM	'YOU FORGOT TO INPUT A MESSAGE -	
	YOU FORGOT TO	INPUT A	MESSAGE '	
07010		DEFB	0	;MESSAGE DELIMITER
07020		END	W4UCH	;EL FIN = EL BEGUINE

The Model III keyboard may be shifted from upper case only to upper and lower case by pressing shift "zero." BEFORE entering ANY upper case commands from the keyboard such as shift "up arrow" to display the prepared message menu, shift "B" to go to "BASIC" or shift "S" to change transmitting speed, you MUST press shift "zero" and THEN THE LOWER CASE LETTER DESIRED to execute the command. Another alternative is to change these commands to @, \*, < or > which do not have any Baudot equivalents to eliminate the shift "zero" foolishness.

Inverting a transmitted or received RTTY signal may be done with either software or hardware. We chose the latter option as it is a simple matter to mount a

single 7404 hex inverter chip on a 1 inch square piece of perfboard and mount it with #16 wire standoffs going to the + 5 vdc and ground terminals on the VAR/80 front panel. Using RCA phono plugs and jacks to the appropriate INPUT and OUTPUT connectors allows normal or inverted operation as desired. When using the TU-170 with this program, the VAR/80 or Interfacer 2 output should be inverted BEFORE driving the TU-170 AFSK keying input. Other TU's should be checked before "going on the air."

## FURTHER PROGRAM NOTES

TIME1, TIME2, and TIME3 in lines 680 to 1050 are used ONLY by the RECEIVE program in Chapter 6. To make them automatic when selecting TRANSMIT MODE speed, they are included in this segment of the program. They may be OVERRULED by the receive mode program, if desired, to allow you to transmit at any one of the 4 Baudot speeds while receiving at another speed.

The time constants used for SPEED2 and TIME5, data bit and stop bit lengths, respectively, in this transmit program, are the constants WE evolved for satisfactory operation using extremely old and decrepit World War II TTY machines for the tests. Do not hesitate to modify them if you wish. REMEMBER to increase them by 15% (fifteen percent) for the Model III.

The origin of the program is set at 28000 decimal to allow the addition of the Baudot receive program in the next Chapter, and still remain under 32767 MEM. As such, the OBJECT code may be loaded into a 16K MEM TRS-80 without difficulty. WHEN USING THE EDITOR/ASSEMBLER (ABOUT 7K BYTES) AND ASSEMBLING THIS PROGRAM (WELL OVER 15K BYTES WITH COMMENTS) IT OBVIOUSLY "WILL NOT" FIT INTO A 16K MEM TRS-80. 48K MEM IS RECOMMENDED FOR ASSEMBLING THE COMBINED TRANSMIT AND RECEIVE PROGRAMS.

## RUNNING THE W4UCH BAUDOT RADIO TELETYPE PROGRAM

Is as straightforward and "Gridley-proof" as we could make it.

### ARE YOU SPEAKING TO I???

Not exactly, Gridley. What we mean is that a number of radio amateurs with NO computer experience have run this program without difficulty after only a few minutes instruction. Here are the minimum instructions necessary to operate the program like an "old time RTTYer" (we do not wish to insult the readers' intelligence with TOO detailed instructions, but are presuming the operator has never seen a TRS-80 before).

1. Turn "ON" the TRS-80 and press ENTER.

2. Install the cassette which has the program BAUDOT and press PLAY. Type in SYSTEM and ENTER. Type in BAUDOT and ENTER. After the cassette has loaded and the ? appears, type in /28000 and ENTER. If all is well, "TRANSMIT MODE - WPM = 60" should appear. If not, adjust cassette volume and try again.

3. With disk, in the DOS command mode, type in "LOAD BAUDOT1" and ENTER. We assume that at least one of your desks, any one, has the object code program, BAUDOT1 on it. If you have NEWDOS+ or NEWDOS80, then type in BASIC,28000 and ENTER, otherwise just type in BASIC and ENTER, answer NO. OF FILES? with another ENTER, and MEMORY SIZE? with 28000 and ENTER. When in BASIC, type in SYSTEM and ENTER, and then type in /28000 and ENTER. "TRANSMIT MODE - WPM = 60" should appear.

4. Press any key which has a Baudot equivalent. ZAP, off goes the program issuing a serial Baudot character at a 60 WPM equivalent speed to port zero which rings the Telesis VAR/80 interface's bell. The VAR/80 OUTPUT terminal #2 issues forth a number of TTL voltage states representing ones and zeroes. The 7404 hex inverter inverts them and drives the TU-170's AFSK KEYING input. The TU-170 generates audio tones of 2125 cycles = MARK and 2295 cycles = SPACE which feeds into the mike input of your amateur single sideband transmitter. You are "on the air" with Baudot radio teletype.

5. Press shift "up-arrow" and the prepared message MENU will be displayed as follows:

### PREPARED MESSAGE SUBROUTINE

CQ = A	QTH = B
CQ DX = C	CQ SS = D
QRZ = E	73 = F
RST 5X9 PLUS = G	RST 5X5 = H
QRX = I	QRM = J
QRN = K	QSY = L
QSY UP = M	QSY DOWN = N
SECTION = O	TRS-80 = P
PROGRAM HERE = Q	RIG HERE = R
RVRYRY = S	QUICK BROWN = T
HANDLE = U	INPUT MESSAGE = V & W

ENTER PREPARED MESSAGE DESIRED ? -

6. These messages are only to illustrate a few of the choices one has. By all means change them to suit your fancy. Try pressing T. First the program will clear the video display and then transmit at a 60 WPM rate:

THE QUICK BROWN FOX JUMPED OVER THE LAZY DOGS BACK 01234567890

Now hit the space bar a few times to bring the \_ cursor over to the left edge of the video display. Then press the "up-arrow" key (NO SHIFT) and press T. The video

display will now print out the 2nd line at a 60 WPM rate.

THE QUICK BROWN FOX JUMPED OVER THE LAZY DOGS BACK 01234567890 THE QUIC-K BROWN FOX JUMPED OVER THE LAZY DOGS BACK 012345678

What happened the second time was that the video display DID NOT clear, nor did you receive the MENU of messages. AFTER 72 characters total were printed, a LEFT ARROW was displayed = auto line feed and carriage return transmitted. NOT CLEARING the screen is often useful in the middle of a contact.

7. Let's press shift "up-arrow" again for the menu. Try pressing W. The screen will clear and the following message will be transmitted at 60 words per minute equivalent speed:

YOU FORGOT TO INPUT A MESSAGE

As the prepared message menu illustrates, one presses V to input a message. The program uses W to send it. Press V and the screen will clear. The program is waiting for you to input a prepared message. All characters on the keyboard are active, but the program will ONLY transmit those which have a Baudot equivalent. SHIFT D (for done) is the way we tell the program our message input is complete. Type in:

W4UMF THIS IS W4UCH/2 FOR I.D. (now press shift D)

Shift D inserts a zero in MEM at the end of the message which tells the program it has finished sending the prepared message. Give it a try. Press "up-arrow", then W.

HOORAY, IT REALLY DOES WORK !!!

Thank you, Gridley.

Actually, the message could be as long as you have memory available to hold it. IF you have 48K MEM you could input up to 30+ pages (1024 bytes per page) of prepared message if desired. This is a bit much, but if you were sending your monthly ham/computer club newsletter quite feasible IF you have the patience to input it from the keyboard. The INPUT message MAY use the ENTER key which transmits a line feed AND carriage return whenever used. IF you wish to input continuous text without using ENTER, a line feed and carriage return will be transmitted automatically after every 72 characters to ensure compatability with standard teletype machines.

7. Now that a prepared message has been transmitted, the program takes us back to the keyboard where we may continue typing in whatever we wish. In Chapter 7, the CLEAR KEY will be used to transfer us to the RECEIVE MODE - WPM = 60. If you wish to change both transmit and receive speed, just press shift S in the TRANSMIT MODE and video will display:

INPUT SPEED 60, 66, 75, 100

Input the speed desired and press ENTER.

8. To return to BASIC, simply press shift B, in TRANSMIT MODE.

## SUMMARY OF CHAPTER 5

The comments with the program's source code are largely self-explanatory and should allow you to follow detailed program flow. The program could have been written in a considerably shorter format, but the program flow and logic would NOT have been as easy to follow. This is BOTH a working program and a TEACHING PROGRAM, so clarity rather than brevity has been the prime consideration. Once you master the logic and program flow of this Chapter's program, you should have little difficulty writing and tailoring a Baudot radio teletype transmit program to your own specific requirements. Why not load part of Chapter 1's Morse transmit program in another MEM location and use it to transmit the Morse I.D. for you every 10 minutes to meet FCC requirements? Just key the space tone. ■

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## HELPFUL HINTS

### World's Shortest Word Processor — Shortened!

While it is true that Jeffrey Vavasour and his father have a **very** short word processor (17 bytes if spaces are omitted), it may be shortened even further: the first semicolon may be omitted with no change in performance:

```
1 PRINTCHR$(14)INKEY$;:GOTO1
```

Also, and less well known, there is the fact that "GOTO" can be made to work without a line number provided that there is a line zero:

```
0 PRINTCHR$(14)INKEY$;:GOTO
```

If one is willing to go to the extra trouble, one could go even further by writing:

```
0 PRINT " INKEY$;:GOTO
```

then PEEKing around the first few bytes of BASIC program storage to locate the blank (32) and POKING that location with 14. (13 bytes!)

(Thanks to James Garon, Sigma Microsystems Inc., 415 West Palmer Avenue, Glendale, CA 91204.)

### World's Second Shortest Word Processor

On page 106 of your reprint of issues #1-#6 (part II), you published a short program that simulated a word processor. I have recently written a program that is only a few lines longer, but can actually be used as a small-purpose word processor with most printers. The instructions are: after typing RUN, type in your text, then press the "@" key to print it. The text must fit on the screen or else whatever is off the screen will not be printed.

```
10 CLS: PRINT CHR$(14);
20 I$=INKEY$: IF I$="@" THEN PRINT CHR$(15);: GOTO 40
30 PRINT I$;: GOTO 20
40 FOR Y=0 TO 15: FOR X=0 TO 63
50 P=PEEK(15360+Y*64+X)
60 IF P>26 THEN LPRINT CHR$(P); ELSE LPRINT CHR$(P+64);
70 NEXT X: LPRINT: NEXT Y
80 PRINT CHR$(14);: GOTO 20
90 END
```

(Thanks to Victor Reiner, 2 Derbyshire Place, Utica, NY 13501.)

### CLEANUP for Canadian Readers

As a recent subscriber to your monthly magazine, I received the complimentary cassette with an excellent fun game — CLEANUP. I just thought other Canadian

readers like myself might like the enclosed change in the program. Perhaps some others could do a better "job" of the Maple Leaf.

To use these changes, delete lines 9800 to 10300 inclusive and replace them with the lines below.

```
9800 CLS: FOR Y=0 TO 1: SET(0,Y): SET(3,Y): NEXT Y:
FOR Y=0 TO 47: SET(1,Y): SET(2,Y): NEXT Y
9805 FOR X=3 TO 124: SET(X,4): NEXT X: FOR X=4 TO 124:
SET(X,38): NEXT X
9810 FOR Y=4 TO 47: SET(4,Y): NEXT Y: FOR Y=4 TO 38:
SET(124,Y): NEXT Y
9815 FOR X=34 TO 93: SET(X,5): NEXT X: FOR X=34 TO 93:
SET(X,6): NEXT X: FOR X=34 TO 93: SET(X,7): NEXT X
9820 FOR X=34 TO 61: SET(X,8): NEXT X: FOR X=66 TO 93:
SET(X,8): NEXT X
9825 FOR X=34 TO 59: SET(X,9): NEXT X: FOR X=68 TO 93:
SET(X,9): NEXT X
9830 FOR X=34 TO 57: SET(X,10): NEXT X: FOR X=70 TO 93:
SET(X,10): NEXT X
9835 FOR X=34 TO 54: SET(X,11): NEXT X: FOR X=73 TO 93:
SET(X,11): NEXT X
9840 FOR X=34 TO 51: SET(X,12): NEXT X: FOR X=78 TO 93:
SET(X,12): NEXT X
9845 FOR X=34 TO 49: SET(X,13): NEXT X: FOR X=78 TO 93:
SET(X,13): NEXT X
9850 FOR X=34 TO 51: SET(X,14): NEXT X: FOR X=76 TO 93:
SET(X,14): NEXT X
9855 FOR X=34 TO 52: SET(X,15): NEXT X: FOR X=75 TO 93:
SET(X,15): NEXT X
9860 FOR X=34 TO 45: SET(X,16): NEXT X: FOR X=48 TO 53:
SET(X,16): NEXT X: FOR X=74 TO 79: SET(X,16): NEXT X:
FOR X=82 TO 93: SET(X,16): NEXT X
9865 FOR X=34 TO 40: SET(X,17): NEXT X: FOR X=50 TO 54:
SET(X,17): NEXT X: FOR X=73 TO 77: SET(X,17): NEXT X:
FOR X=87 TO 93: SET(X,17): NEXT X
9870 FOR X=34 TO 40: SET(X,18): NEXT X: FOR X=52 TO 55:
SET(X,18): NEXT X: FOR X=72 TO 75: SET(X,18): NEXT X:
FOR X=87 TO 93: SET(X,18): NEXT X
9875 FOR X=34 TO 38: SET(X,19): NEXT X: FOR X=54 TO 56:
SET(X,19): NEXT X: FOR X=71 TO 73: SET(X,19): NEXT X:
FOR X=89 TO 93: SET(X,19): NEXT X
9880 FOR X=34 TO 40: SET(X,20): NEXT X: FOR X=87 TO 93:
SET(X,20): NEXT X
9885 FOR X=34 TO 42: SET(X,21): NEXT X: FOR X=85 TO 93:
SET(X,21): NEXT X
9890 FOR X=34 TO 44: SET(X,22): NEXT X: FOR X=83 TO 93:
SET(X,22): NEXT X
9895 FOR X=34 TO 46: SET(X,23): NEXT X: FOR X=81 TO 93:
SET(X,23): NEXT X
9900 FOR X=34 TO 48: SET(X,24): NEXT X: FOR X=79 TO 93:
SET(X,24): NEXT X
9905 FOR X=34 TO 50: SET(X,25): NEXT X: FOR X=77 TO 93:
SET(X,25): NEXT X
9910 FOR X=34 TO 52: SET(X,26): NEXT X: FOR X=75 TO 93:
SET(X,26): NEXT X
9915 FOR X=34 TO 54: SET(X,27): NEXT X: FOR X=73 TO 93:
SET(X,27): NEXT X
```

9920 FOR X=34 TO 56: SET(X,28): NEXT X: FOR X=71 TO 93:  
 SET(X,28): NEXT X  
 9925 FOR X=34 TO 54: SET(X,29): NEXT X: FOR X=73 TO 93:  
 SET(X,29): NEXT X  
 9930 FOR X=34 TO 52: SET(X,30): NEXT X: FOR X=75 TO 93:  
 SET(X,30): NEXT X  
 9935 FOR X=34 TO 50: SET(X,31): NEXT X: FOR X=77 TO 93:  
 SET(X,31): NEXT X  
 9940 FOR X=34 TO 63: SET(X,32): NEXT X: FOR X=65 TO 93:  
 SET(X,32): NEXT X  
 9945 FOR X=34 TO 63: SET(X,33): NEXT X: FOR X=65 TO 93:  
 SET(X,33): NEXT X  
 9950 FOR X=34 TO 63: SET(X,34): NEXT X: FOR X=65 TO 93:  
 SET(X,34): NEXT X  
 9955 FOR X=34 TO 93: SET(X,35): SET(X,36): SET(X,37): NEXT X

(Thanks to Robert D. Walsh, 16 Gaston Road,  
 Dartmouth, Nova Scotia B2Y 3W1.)

### Mistake in February Issue

This is probably letter #10000 regarding this matter, but on page 49 of the February 1981 issue under Helpful Hints there is a mistake in line 140. The line should read Z1=Z1-1. The program will then work fine.

(Thanks to Richard Eidmann, 4244 M Street,  
 Philadelphia, PA 19124.)

### Printer Problems with Linefeeds ?

If your printer occasionally misses a line feed when running mailing labels, insert a short time delay in the program between line feed commands to give the paper advancing ratchet time to fall into place. Something on the order of:

820 FOR Y=1 TO 100: NEXT Y

It doesn't slow the throughput down much, and may tend to make the alignment with the label stock much more dependable.

(Thanks to Gordon Speer, 3304 Woodlawn Road,  
 Sterling, IL 61081.)

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# QUESTIONS AND ANSWERS

Conducted by Hubert S. Howe, Jr.

## QUESTION

from Sanford Bendix, 230 S. Aiken Avenue, Pittsburgh, PA 15206: I have recently received my free cassette, for which I thank you. However, I have just started to use the Word Processor program and think that there is a bug in line #4110. It reads:

```
110 GOSUB 5000: IF A=13 THEN 2900 ELSE IF A<32 THEN 410
```

The problem is that you get a "UL ERROR" (undefined line) because there is no line 410 to go to as referred to at the end of the statement.

I have not had a chance to study the program personally, and would appreciate it if you could please advise what the correct number is supposed to be at the end of line 4110. Thank you.

## ANSWER

That should be 4110 at the end of the line. Also check a ">" instead of a "?" in our copy.

## QUESTION

from Richard E. Owen, 2120 Spruce Street, Trenton, NJ 08638: I have a big problem and I hope you will be able to help me. I have a TRS-80 16K Level II and am in the process of adding a disk drive without the use of the RS expansion interface. Instead I purchased the 8100 board by HUH (which, I think, has been changed to California Computer Systems), and the Versafloppy II disk controller. If you are not familiar with the 8100, I shall explain: the board, as claimed by its maker and Priority One Electronics, is an S-100 bus interface for the TRS-80. However, it also has parallel and serial I/O, space for 16K RAM on board, and six slots for S-100 boards. Before buying the two boards, I placed a call to Priority One and asked what was needed to hook up a disk drive to the system. They told me that all I would need would be a DOS such as CP/M. Now, after completing the two boards (I bought them as kits) and purchasing a Calcomp Model 140 disk drive, I am lost. After reading the Versafloppy II manual, they say I need a DDBIOS and a DOS such as CP/M; however, they say they load at F000 and 0000 respectively. Versafloppy has the DDBIOS available as a PROM. Would this help me? Can I get a standard TRS-80 DOS, or do I have to find someone to create a special system to get everything up and running? Right now I feel that I have a bunch of non-compatible pieces. I hope that there is a reasonable solution, because, like most hobbyists, I have a limited budget.

## ANSWER

In a nutshell, you have been sold a bill of goods, and there is no easy or inexpensive way out for you. This is a BIG problem for many people, because they can't really tell what they need from the descriptions of products in advertisements, and many of the salespeople that are selling these items don't know what to say either.

The fundamental problem in this whole situation is that the TRS-80's memory is organized differently from most other microcomputers. ROM is placed at 0000 through 2FFF (or 37FF on the Model 3), and 3800 to 3FFF contain memory-mapped input output devices. RAM doesn't start until 4000. Most other computers start RAM at 0000 and put ROMs up in high memory, such as F000. The basic reason why the products you have purchased will not work is that you will have to move all the TRS-80's ROM first, and then worry about putting in the appropriate software in the form of PROMs or files on your disk drive to get your system up and running. This is much easier on computers like the S-100 systems, where all devices go into separate boards in slots on the motherboard, but not in a TRS-80.

There is a device called the Omikron Mapper which relocates the ROM up to C000 and places RAM at 0000, but I don't even know whether it would work with the boards you have. It was designed to allow TRS-80 users to work with eight-inch disk drives.

The final difficulty with your configuration is that, when it is finished, it will not be a TRS-80! You will have to work up your own disk operating system, and it may be incompatible with anything else. Sure, the guy said that all you need is CP/M, but there are as many CP/M systems as there are computer systems, even though, when finished, all disk-based programs will run on any of them. The TRS-80 Model I CP/M is different from any other version, and may not work with your hardware unless you rewrite most of it.

I would advise you to try to get as much of your money back as you can, claiming that the salesmen misrepresented the products to you when you purchased them. You might also sell the boards on the used-equipment market by placing an ad in a paper like **Computer Shopper**. The HUH 8100 is useful as a means of interfacing special-purpose S-100 boards to the TRS-80, so it is not a useless piece, but the rest is not for a TRS-80. You could buy an S-100 mainframe, CPU board and RAM and use this equipment with a different computer system, but that would be the most expensive solution. I would recommend that you get a standard TRS-80 Expansion Interface (or maybe some-

thing like the LNW EI) and standard disk drive. Also, you should act soon, because there will only be a limited number of Expansion Interfaces available this year, and after this year it may not be possible to get them at all.

\*\*\*\*\*

Got a question about the TRS-80? Send it to **Questions, H & E Computronics, 50 North Pascack Road, Spring Valley, NY 10977**. If you wish a personal reply, please enclose a self-addressed, stamped envelope. ■

*continued from page 21*

```
2070 REM    ENTRY FOR DELETE ROUTINE.
2080 CLS : PRINT C1;C5 : PRINT @ 41, H; : PRINT @ 12, "Delete";
2090 PRINT @ 462, "WHAT LINE DO YOU WISH TO DELETE";
2100 INPUT L : IF L < 0 OR L > H GOTO 2100
2110 PRINT @ 704, L; : "A(L) : PRINT @ 584, "DELETE THIS
LINE? "
2120 D=INKEY$ : PRINT D; : IF D = "" GOTO 2120
2130 IF D = "Y" GOTO 2160
2140 PRINT : PRINT "Delete cancelled" : FOR I2=1 TO 300
2150 NEXT I2 : CLS : GOTO 1730 : ' RETURN TO EDIT MAIN.
2160 FOR I=L TO H-1 : A(I)=A(I+1) : NEXT I
2170 A(H)=" " : H=H-1 : CLS : GOTO 1730 : ' RETURN TO EDIT MAIN.
2180 REM    ENTRY FOR INSERT ROUTINE.
2190 CLS : PRINT C1;C5 : PRINT @ 41, H; : PRINT @ 12, "Insert";
2200 PRINT @ 512, "(INSERTION WILL BE AFTER THE CURRENT LINE)"
2210 PRINT @ 448, "WHAT IS THE LINE NUMBER YOU WISH TO INSERT";
2220 INPUT L : IF L < 0 OR L > H GOTO 2220
2230 IF L = H GOTO 2260
2240 FOR I=H TO L+1 STEP -1
2250 A(I+1)=A(I) : NEXT I
2260 H=H+1
2270 PRINT @ 640, "WHAT IS THE NEW LINE?" : PRINT @ 768, "";
```

```
2280 LINE INPUT A(L+1) : PRINT "NEW LINE LENGTH IS ";
LEN(A(L+1));
2290 FOR I2=1 TO 300 : NEXT I2 : CLS : GOTO 1730 : ' RETURN
2300 REM    ENTRY FOR TEST BRANCH.
2310 CLS : PRINT C1;C5 : PRINT @ 41, H; : PRINT @ 12, "Test";
2320 J1=0 : G=" " : FOR I=1 TO H
2330 J=LEN(A(I)) : IF J > 61 GOSUB 1630
2340 IF J > J1 THEN J1=J
2350 NEXT I
2360 IF J1 < 62 THEN PRINT @ 512, "TEXT LENGTH CORRECT " :
GOTO 1730
2370 CLS : PRINT C1;C5 : PRINT @ 41, H; : PRINT @ 12, "Test";
2380 PRINT : PRINT " * * * ERRORS FOUND * * *"
2390 PRINT @ 448, G : PRINT @ 960, "TYPE ENTER TO CONTINUE";
2400 D=INKEY$ : IF D = "" GOTO 2400
2410 PRINT @ 960, STRING$(28, " ") : GOTO 1730
2420 REM    TERMINATE ROUTINE
2430 CLS : PRINT C1;C5 : PRINT @ 41, H; :
PRINT @ 12, "Terminate";
2440 IF H > 48 PRINT "TEXT IS";H;"LINES LONG" : GOTO 1730
2450 PRINT @ 516, "RETURNING TO MAIN TEST"
2460 PRINT @ 576, "(TEXT MUST PASS TEST BEFORE PROGRAM WILL
CONTINUE)"
2470 FOR I=1 TO 800 : NEXT I : CLS : RETURN
2480 REM
2490 REM    AUTOMATIC ENTRY ROUTINE.
2500 INPUT "HOW MANY LINES OF TEXT TO BE ENTERED"; H
2510 IF H < 1 OR H > 48 PRINT "ILLEGAL VALUE, TRY AGAIN" :
GOTO 2500
2520 FOR I=1 TO H
2530 PRINT I; : LINE INPUT " : "; A(I) : NEXT I
2540 CLS : RETURN
2550 REM
```

Joseph Rosenman  
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# Editor Assembler

## For The TRS-80 Models I, II, III



**EDAS** is the ultimate disk based Editor Assembler for the TRS-80 Model I, II, and III computer. Among its features are direct assembly from disk source files or memory buffer, IF conditional assembly commands, fully formatted printer output, assembly to disk or to memory, and a full feature editor.

Default file extensions of /ASM for source files and /CMD for object code files are provided.

**EDAS** will support both upper and lower case entries. Opcodes and labels entered in lower case can be automatically converted to upper case.

All **EDAS** versions respect the HIGH\$ memory protect pointer, and also allow for warm restarts from the DOS level or from the system debugger.

**EDAS** comes with a complete operator's manual and a cross reference utility program. Model I and III versions also include a disk to tape utility, and a CMDFILE utility for disk-to-disk, tape-to-disk, disk-to-tape program loading and concatenation.

### ASSEMBLY FEATURES

A \*GET directive allows assembly directly from disk source files, providing a capacity limited only by the size of the symbol table in memory! Source files may also be linked by multiple \*GET statements in the main program, allowing literally hundreds of thousands of bytes of source code to be assembled.

Conditional assembly is provided through the use of an IF directive. Allowable conditions are Greater Than, Less Than, and Equal.

Allowable operators are + (addition), - (subtraction), < (shift), & (logical AND), ! (logical OR), # (exclusive OR), \* (multiply), / (divide), and % (modulo).

Object code may be assembled to disk or directly to memory. A Branch command allows jumping to the code in memory for debugging, with an exit provided back to the editor assembler with the source code intact.

Assembly to a line printer allows adjustment of page length and lines per page. Also provided are Title, Subtitle, Page, and Space psuedo ops, allowing for the exact labeling and formatting of printed output you need.

A COM psuedo op allows comment lines to be written to a disk file along with the object code. These comment blocks will not be loaded with the object code, but merely provide an easy way to store such things as copyright messages in your object code files.

Constants can be entered in hexadecimal, decimal, octal, or binary format.

The assembler will generate a symbol table sorted in alphanumeric order. The output will be in three across format, with symbols of up to 14 characters allowed. An additional cross reference file may also be generated for use with the XREF utility program

### EDITOR FEATURES

**EDAS** will Write and Load text files directly to or from disk, with provision for text file concatenation. Many different types of text files can be loaded by the editor, including files without line numbers.

The editor can write source files with or without line numbers, and with or without a header.

For ease of editing, the editor provides for block Moves of lines, Global replacement of text strings over the entire buffer, and a Find command to locate all occurrences of a specified text string.

Individual line editing maintains command syntax identical to the BASIC editor - Character Insert, Delete, Change, Locate, Kill, Hack, New Line, Display Line, Quit, etc. are all supported.

The text buffer can be printed in whole or in part, with or without line numbers.

All versions provided for disk directory displays, and allow the user to kill disk files while remaining in the editor assembler.

The editor provides over 32K of text buffer space. The Assembler portion of the program may be deleted from within the editor, thus increasing the size of the available text buffer by approximately 5K.

Memory utilization can be determined with the Usage command, which displays the bytes used by the text, the bytes available, and the first free address.

A View command allows review of disk source file without actually loading the file into the text buffer.

All versions of **EDAS** provide controlled text scrolling capabilities, as well as a functional Clear Screen key.

### EDAS SPECIFICATIONS

#### HARDWARE REQUIRED:

All versions require 32K of memory with one disk drive.

#### TEXT BUFFER CAPACITY:

Model I & III - about 32K (with 48K system)

Model II - about 40K (with 64K system)

#### TEXT FILES:

Source files are compatible between versions.

Most ASCII source files may be read.

Text concatenation is supported.

Conditional assembly is supported.

Macros are not supported.

Source files can be written with or without headers and line numbers.

Up to 14 characters are allowed for labels.

Linking of source files is supported.

#### OBJECT FILES:

Object code may be assembled to disk or to RAM.

Disk object files are directly executable.

RAM object code may be executed from the editor.

#### COMMANDS:

The commands and syntax in the Radio Shack Model I Editor Assembler are a small subset of **EDAS**. Users already familiar with that assembler will be able to function in **EDAS**'s advanced environment immediately.

#### MANUAL

The complete manual is over 70 pages and contains complete descriptions of all commands and parameters.

**EDAS Model I, III**

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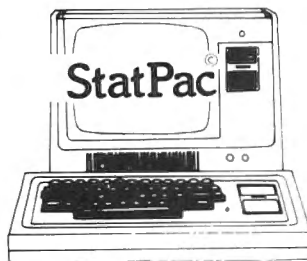
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From the January 1981 issue of the CSRA Computer Club newsletter:

There was some amusement at the November meeting when the Radio Shack representatives stated that the software in the ROM cartridges could not be copied. This month's 68 Micro Journal reported they had disassembled the programs on ROM by covering some of the connector pins with tape. They promise details next month. Never tell a hobbyist something can't be done! This magazine seems to be the only source so far of technical informations on the TRS-80 color computer®. Devoted to SS-50 6800 and 6809 machines up to now, 68 Micro Journal plans to include the TRS-80 6809 unit in future issues.

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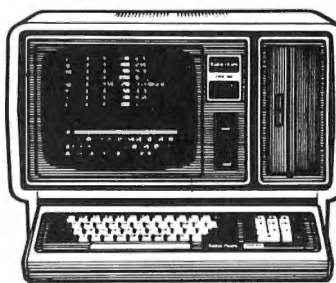
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